

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF ILLINOIS
EASTERN DIVISION

THE UNITED STATES OF AMERICA,)	
)	
Plaintiff,)	
)	
vs.)	No. 78 C 1004
)	
OUTBOARD MARINE CORPORATION)	
AND MONSANTO COMPANY,)	
)	
Defendants.)	

The deposition of ROBERT V. THOMANN,
called by the Defendant Outboard Marine Corporation
for examination, pursuant to notice and agreement and
pursuant to the Rules of Civil Procedure for the
United States District Courts pertaining to the taking
of depositions, taken before Thea L. Urban, a Notary
Public in and for the County of Cook, State of
Illinois, and a Certified Shorthand Reporter of said
State, at the United States Attorney's Office, Room
1400 Conference Room, 219 South Dearborn Street,
Chicago, Illinois 60604, on the 17th day of September,
A.D. 1981, commencing at 10:00 o'clock a.m.

PRESENT:

MR. JAMES T. HYNES,
Deputy Chief, Civil Division
(United States Attorney's Office
219 South Dearborn Street, Room 1486
Chicago, Illinois 60604),

appeared for the United
States of America;

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16-5V28.0/071

PRESENT: (Continued)

MR. MICHAEL A. POPE,
MS. ROSEANN OLIVER,
(Phelan, Pope & John, Ltd.,
30 North LaSalle Street
Chicago, Illinois 60602),

and

MR. JEFFREY C. FORT,
(Martin, Craig, Chester & Sonnenschein
115 South LaSalle Street
Chicago, Illinois 60603),

appeared for Outboard Marine Corporation;

MR. BRUCE A. FEATHERSTONE,
(Kirkland & Ellis
200 East Randolph Drive
Chicago, Illinois 60601),

appeared for Monsanto Company.

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I N D E XWITNESS:Direct Cross Redirect Recross

ROBERT V. THOMANN

By Mr. Pope

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E X H I B I T SThomann-OMC Deposition
ExhibitMarked for ID

No. 1

7

No. 2

70

No. 3

119

No. 4

196

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MR. POPE: Let the record show this is the deposition of Dr. Thomann being taken pursuant to notice and agreement of counsel and the witness as to time and place, proceeding in accordance with the Rules of Civil Procedure.

(Witness sworn.)

ROBERT V. THOMANN,
called as a witness herein, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. POPE:

Q Would you state your name and spell your last name for the reporter, please.

A My name is Robert V. Thomann, T-h-o-m-a-n-n.

Q Where do you reside, Mr. Thomann?

A I reside in Ridgewood, New Jersey.

Q Give us your home address and your office address.

A 227 Sunset Avenue, Ridgewood, and my office is Manhattan College, Environmental Engineering and Science, Bronx, New York.

Q What is your profession?

A I am an Environmental Engineer.

Q Do you practice your profession under any

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corporate name or trade?

A Yes. I am a principal consultant to the firm of HydroQual, H-y-d-r-o-Q-u-a-l, in Mahwah, M-a-h-w-a-h, New Jersey.

Q Could you tell me just generally what it means to be an environmental consultant. Does that mean you have an ownership interest in the firm?

A Yes, I have a small ownership interest in the firm as a principal consultant. I spend whatever consulting time I have available from my educational responsibilities with that firm.

Q Would you give us an estimate in the last two or three years, how your time has been broken down between teaching and working with HydroQual?

A HydroQual has only been in existence since May of 1980, so over the last year probably on the order of a day, day and a half a week during the academic year and maybe two to three days during the summer when my academic classes are not in session.

Q Would a fair overall evaluation be 20 percent of your time while you are in school and 40 percent of your time during the summer?

A Yes.

Q Are there any other organizations with which

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you are associated in the area of consulting or any other work involved with environmental engineering?

A I do some occasional consulting for the Pan American Health Organization within the last year and there may have been one or two other occasions, a day or so, for somebody else, small consulting firm.

Q Could you tell me what Hydrosience is?

A Hydrosience used to be a firm in water pollution control, a consulting firm in water pollution control, process design as well as mathematical modeling of natural water systems.

Q That is what they used to be. What happened to it?

A It was bought out by Dow Chemical several years ago, seven years ago. In the Spring of 1980, Dow Chemical elected to close out Hydrosience as a corporation, although they still apparently, to my understanding, maintain the name but it is a Shell Corporation at the present time.

Q Were you associated with Hydrosience, Inc.?

A Yes, I was.

Q In what capacity?

A Initially before the purchase of Hydrosience by Dow, I was consultant to Hydrosience with small

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ownership of a couple percent and when Dow purchased Hydrosience, I was consultant to Hydrosience.

Q Mr. Hynes has favored us this morning with a document entitled Task Force Contract No. 68-03-2568, and I am going to ask the court reporter if she would mark this document as Thomann Deposition Exhibit No. 1 for identification and have you look at it and tell me what it is, please.

(Thomann-OMC Deposition

Exhibit No. 1 marked for

identification, 9/17/81, TLU.)

BY THE WITNESS:

A Yes, this is the contract, essentially the Hydrosience work contract that Hydrosience undertook in the first evaluation of the PCBs in Waukegan Harbor.

BY MR. POPE:

Q When was that contract entered into?

A I don't recall the exact date, but it was probably sometime in the Spring of 1979, somewhere around there.

Q Were you involved in the initial discussions regarding work for the U.S. Government at Waukegan Harbor?

A Yes.

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Q Were you the one that was sought out by the Government for that project?

A Yes, I was.

Q I take it the reason the contract was through Hydrosience is because you were at that time operating as a principal consultant for that company, is that right?

A Yes, that is correct.

Q This was in early 1979?

A Yes.

Q With whom did you have your initial contacts involving Waukegan Harbor?

A My first initial contacts with the Federal Government were from Gil Veith, EPA laboratory in Duluth, and I was asked to provide some evaluation of a sampling program and a very preliminary evaluation of PCBs in the sediments of Waukegan Harbor. That actually predated Hydrosience's work.

Q When did that first contact with Mr. Veith take place?

A That would have taken place, probably very early '79, to the best of my recollection, a few months, several months before this.

Q Do I correctly understand you were asked to

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comment on the sampling program under way?

A Well, actually to suggest the sampling program.

Q What else?

A To provide some very preliminary evaluation of the sediment mass in PCBs.

Q To provide some preliminary evaluation of the sediment mass of PCBs?

A Yes.

Q What is that, how many PCBs were --

A Well, to review --

Q Am I correct that means to make a preliminary evaluation of the amount of PCBs in the sediment in the Waukegan Harbor and that surrounding area?

A It was really to review what had been done up to that point, sampling that had been done, estimates that had been made, and on the basis of that, to recommend a sampling program.

Q Was I correct that the overall purpose though was to determine the amount of PCBs in the sediment in the Waukegan Harbor and surrounding area?

A The principal purpose was to provide some guidance on a sampling program.

Q To what end, as far as you understood?

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A As far as I understood, the purpose of the sampling program would be to measure at that time the level of water column PCBs, the level of possible trace substances, such as chlorides, in the Harbor system.

Q I take this was not an academic exercise but rather had some overall purpose, is that correct?

A Yes, yes.

Q Can you tell me what your understanding was from your very first contact with Dr. Veith, the overall purpose of this work you were asked to do?

A The first and foremost purpose that I understood from Dr. Veith was to estimate the amount of PCB exchanging between the Harbor and the Lake. That would be the long term objective of what was at that time the basis for a proposed sampling program.

Q Was Dr. Veith assuming there was some exchange?

A Yes.

Q Do you know what that assumption was based on?

A No.

Q Was this an oral discussion?

A Yes.

Q Physical meeting, telephone call, what was it?

A Telephone call.

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Q He called you and you were at Manhattan College at the time?

A Yes.

Q Was that your first contact with Waukegan Harbor?

A As far as I recall.

Q What had been your background in areas relating to this type of project; namely, estimating the amount of PCBs exchanged between the Harbor and the Lake?

A I have had a fair number of years of experience in modeling and water quality behavior in a wide variety of water bodies, and for a wide variety of substances, including in the years just prior to the time that I was asked by Dr. Veith, some work we had done on the Hudson PCB Project, so I assume that he had some knowledge of that.

Q Would you tell me what you did with respect to the Hudson River?

A The Hudson River, I was consultant to Hydro-science for two studies, one on evaluation of various dredging alternatives in the Upper Hudson on PCB and the Lower Hudson; then a study on the uptake of PCB into the aquatic food chain.

Q Were there two separate studies?

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A Yes.

Q Am I correct in understanding that the initial, the first one you referred to devoted itself to studying alternatives to dredging as a way of dealing with the Hudson River problem?

A No, it was an evaluation of varying dredging alternatives.

Q What does that mean, that you are assuming that dredging is going to be done and which way to go about it?

A What would be the effect of dredging to different levels of PCB in the sediment at different locations upstream on the Hudson.

Q At any time in your work on the Hudson River, did you consider alternatives to dredging as a means of dealing with the problem?

A No, we were not asked to.

Q Did your work on dredging alternatives in the Hudson River result in a report?

A Yes, it did.

Q Was it a single report?

A There were two reports.

Q Can you identify those for me somewhat?

A I don't understand.

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Q Do you know what the titles were, the dates they were issued and were they published, and if so, where?

A I don't recall the exact dates they were issued, but the first was a title similar to the Fate of PCBs in the Hudson River and the second was Ecological Fate of PCBs in the Hudson River Ecosystem.

Q I take it both those articles dealt with the dredging alternative work as well as the PCB uptake into the aquatic life?

A That's correct.

Q Were those articles published?

A Yes.

Q Where?

A Published by us for the New York State Department of Environmental Conservation in Albany.

Q Was that your client on that work?

A Yes.

Q What role did Dr. Veith play in that particular project?

A He did not.

MR. HYNES: Excuse me, do you mean the work that Dr. Thomann did?

MR. POPE: Yes, if any.

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BY THE WITNESS:

A He did not play any role in that.

BY MR. POPE:

Q When you referred earlier to the Hudson River, am I correct you were saying that Dr. Veith was aware of your work for New York State on that project and he mentioned that as a reason why he called you on the Waukegan Harbor?

A Yes. That work was also published in the New York Academy of Sciences as a paper in one of their proceedings.

Q Substantially unchanged?

A The paper was a synopsis of the first larger report.

Q Did you make recommendations to the New York State body with respect to dredging?

A No.

Q Can you summarize briefly for me what the result of your work was with respect to dredging in the Hudson River?

A In the first report, we indicated that dredging in the upper river to various levels would result in some reduction in the PCB concentration of the Upper Hudson.

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There was some concern about the impact that that dredging would have on the Lower Hudson.

The second report where the emphasis was on the ecosystem, we estimated the reduction of PCB in the striped bass, which was the primary fish of concern, under several alternative dredging programs and presented that range of responses in the fish due to different dredging alternatives.

Q Would it be fair to say that one of the aspects of your study was to analyze adverse effects on the Lower Hudson from the dredging projects that were being proposed?

A No.

Q Will you tell me what you mean when you said "concern for the Lower Hudson"?

A Oh, that. The impact of dredging upstream at Fort Edward where the General Electric Plant discharged would not result in a significant reduction in the PCBs leaving the Upper Hudson and entering the Lower Hudson.

Q As part of your work there, did you give any attention to adverse consequences of dredging in the Hudson River?

A No.

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Q Do you know if someone else did in connection with that overall project?

A Yes, there was another firm, if I recall.

Q Who was that?

A Malcolm Purney (phonetic).

Q Did you have access to their report in preliminary form or final form?

A No.

Q Have you ever read their conclusions or any draft of their final report?

A No.

Q Was that published, to your knowledge?

A Yes.

Q Am I correct that that type of report would be outside of your range of expertise?

A Yes.

Q Were your recommendations on the Hudson River followed, to your knowledge?

A Yes, to the extent that our recommendations dealt with need for certain evaluation and studies to be carried out, yes.

Q I do not intend to go into any great detail on the Hudson River, but do I understand that you recommended additional studies to be carried out, those

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additional studies were carried out, and as a result of those studies a decision was made not to dredge?

A No, that is not correct.

Q Tell me how it goes.

A After the first study, we made some suggestions on additional work that had to be done. That was followed up and naturally resulted in a second study, but our work was only part of a much larger effort involving a great number of inputs from a variety of people.

Our work formed one part of the entire effort.

Q You recommended additional studies. Were they done by someone else?

A Yes.

Q What did those additional studies generally deal with?

A They dealt with sampling.

Q What kind of sampling?

A Water column sampling, fish sampling.

Q Besides your general experience in the area of modeling for the purposes of water quality and the specific work you undertook in connection with the Hudson River, is there anything else in your background

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that would specifically qualify you among various environmental engineers for the work that Dr. Veith proposed when he contacted you in early 1979?

A Well, certainly some of the work that we had been doing on the Great Lakes generally, research program at Manhattan College for 10 years or so.

Q Is that a project that is funded directly to the college as opposed to any other --

A Yes.

Q -- outside consulting organization?

MR. HYNES: Doctor, just wait until Mr. Pope finishes his question.

BY MR. POPE:

Q Your answer was yes, is that right?

A Yes.

Q Can you give me a description of what work you have participated in in connection with evaluation of the Great Lakes?

A Work began in the early '70s with evaluation of the effect of various nutrient controls on eutrophication.

Q The effect of nutrient controls on what?

A E-u-t-r-o-p-h-i-c-a-t-i-o-n, proliferation of aquatic plants in the Lake.

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Subsequent to that, that work extended several years. Subsequent to that, we began some work on toxic substances in the Great Lakes as a whole.

Q When did that change in focus begin?

A About 1976, 1977.

Q Was there separate funding for this focusing on toxic substances?

A Yes.

Q Where was that funding from?

A From EPA.

Q Who was in charge of that program?

A In EPA?

Q Yes.

A That was the Grosse Ile Laboratory.

Q Is that work still under way?

A Yes.

Q Can you give me an approximation of the amount of funding that has been incurred to date on that study of toxic substances, the portion of the Great Lakes study?

A The work that I was specifically involved in was funded at about one hundred to \$125,000 a year for the first year, maybe a hundred fifty for the second, and maybe about one hundred twenty-five or something

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like that.

Q Is that a total of both salaries, expenses, hardware?

A Yes, that is the entire project.

Q Were there other sub-projects being worked out of Manhattan College that involved the toxic substances study of Great Lakes beside the one you were doing?

A Yes, one of my colleagues also has a project with the EPA on toxic substances in the Great Lakes.

Q How does his project differ from your project?

A He is concentrating much more on the sediment interaction.

Q What is his name?

A Dominic Dituro, D-i-t-u-r-o.

Q Is he also a professor of Manhattan College?

A He is an adjunct.

Q That means a part-time professor?

A Yes.

Q Is his work, as far as you know, commissioned by the Grosse Ile Laboratory as well?

A That is correct.

Q As far as you know, was his funding roughly the same as the figures you have just given for the

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three years?

A Yes.

Q Have you discussed his work on this Great Lakes project with him?

A Yes.

Q Has he discussed his work with you?

A Yes.

Q Can you tell me about your study in connection with toxic substances in the Great Lakes?

A Yes. Right now the study has progressed through several stages. The first stage was a study of the physical-chemical interaction on toxic substances in the Great Lakes as a whole. Recently it has included the uptake of PCB into the food chain of Lake Michigan.

Q How recently?

A We are still in that, still working on that project.

Q When did you begin working on that?

A About two years ago.

Q About 1979?

A Yes.

Q Why don't you tell me what you did before then, the study of toxic substances in the Great Lakes?

A I had done some work on the food chain uptake.

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Q Of what?

A PCBs and radionuclides in the Great Lakes.

Q Food chain uptake of PCBs and what?

A Radionuclides.

Q What else have you done between the period of '76 and '79?

A Then the work with that physical-chemical interactions of toxic substances of the Great Lakes.

Q I am correct, am I not, in assuming that prior to Dr. Veith contacting you, your work in connection with the Great Lakes study of toxic substances had not focused on Waukegan Harbor; is that right?

A Not directly.

Q Tell me what you mean by that.

A Indirectly in the sense that we had been doing some work on Lake Michigan as a whole, trying to estimate the inputs into Lake Michigan, specifically of PCBs. I was aware at that time that there had been some statements made about the possible impacts of Waukegan Harbor for PCB discharge on the Lake, so to that degree, an indirect --

Q That was the sum total of your involvement with Waukegan Harbor prior to Dr. Veith calling you?

A Yes.

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Q What other sources had you studied of PCB coming into the Lake other than Waukegan Harbor prior to Dr. Veith calling you?

A It would have been preceding --

MR. HYNES: I would object to your word study. I don't think he said he studied the Waukegan Harbor.

MR. POPE: I will start again.

BY MR. POPE:

Q Prior to the time that Dr. Veith contacted you, what sources of PCB coming into the Lake had you studied as part of this Great Lakes project?

A Precipitation, tributary inputs and inputs from direct municipal discharges.

Q Any others?

A The downstream lakes, it would also include the input of PCB from an upstream lake. In the case of Michigan, that does not apply.

Q I assume when you say you studied precipitation, for example, as a source, that was a positive study, you found there was contribution of precipitation into the Great Lakes from PCBs?

A That is correct.

Q And the same with tributary inputs, is that correct?

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A That is correct.

Q Were these measurable additions to PCBs in the Great Lakes?

A I'm afraid I don't understand.

Q Maybe you could tell me how you studied and what you were doing when you say you studied precipitation and tributary inputs and municipal discharges of PCBs into the Lake.

What physically did you do?

A What we normally do and what we did do in this case was to evaluate the literature, who has measured precipitation, PCBs, for example, in the precipitation; who has measured PCBs in the tributaries; what are the normal levels of PCBs one might expect to have in a municipal treatment plant.

We would normally go into literature and see whatever other people had measured for those inputs.

Q With the view of pulling together the literature in one place and then publishing an article in search of literature?

What was your purpose?

A No, with the view of attempting to establish what the order of magnitude of the input of PCBs is or was from each of those sources.

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Q I realize you may not have published anything on that study prior to that time that Dr. Veith contacted you, but can you give me some estimates of what you had found with respect to these other sources of PCBs to the Great Lakes?

A We found that the input from precipitation and specifically precipitation is a rather large PCB source, was believed to be a rather large PCB source in the Great Lakes system.

Q A large source, are you talking about 50 percent, 40 percent?

Is there a way to make some kind of gross estimate like that?

A The range of input was relatively large, but better than 50 percent, maybe closer to three-quarters.

Q How about tributary inputs?

A My recollection is it was maybe another 10 percent.

Q How about municipal discharges?

A Depending on the lake, it would be another 10 or 15 percent.

Q Were these findings relatively consistent lake to lake among the Great Lakes, as you recall?

MR. HYNES: Which findings, all of them?

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MR. POPE: 75 percent, 10 percent and 15 percent?

BY THE WITNESS:

A As I recall they were relatively consistent.

BY MR. POPE:

Q Had that study progressed any by early 1979 beyond simply collecting the literature?

A Yes, at that point we had also made some model runs of the Great Lakes system as a whole with inputs of solids as well as inputs of some radionuclides, and as I recall, we made some runs at that point.

Q Had those runs dealt with PCBs?

A Yes.

Q What assumptions if you recall were made with respect to PCBs coming to the Lake from the Waukegan area?

A At that point we had no load coming in from Waukegan.

Q Were there other sources of PCBs coming into Lake Michigan that you had studied prior to early 1979 beyond Waukegan Harbor that were attributed to industry?

MR. HYNES: I think I need to hear the question again. The word beyond troubled me.

MR. POPE: Let me try to simplify it if I can.

BY MR. POPE:

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A In the Great Lakes as a whole?

Q Yes, sir.

A Yes, as part of our early work.

Q Did that search consist of looking at the literature or a published article?

A Yes.

Q Anything else?

A No, that was about it.

Q Did the grant that you got from the U.S. EPA in 1976 to study toxic substances in the Great Lakes, has the work under that been completed?

A Yes, the one grant is completed, essentially now.

Q That was the three-year grant, the three-year study?

A That is correct.

There was an earlier grant -- there have been a whole series of grants, the first work begun and which was completed. That was completed in 1978.

The second three-year project was completed, is in the final completion stages now.

Q The first grant that was completed in 1978, did that result in a paper?

A That resulted in several papers.

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(Brief interruption.)

THE WITNESS: Is there a question, excuse me?
I lost the answer.

(Answer read.)

MR. HYNES: You better reread the question, too.

(Record read.)

BY MR. POPE:

Q Would you tell me where they were published
or what they dealt with or both?

A There were reports published as part of the
EPA research series and they dealt with primarily
eutrophication and one report dealt with toxic sub-
stances in the food chain.

Q What are we talking about, three reports or
four?

A Two.

Q One, eutrophication and one, food chain?

A One major, eutrophication, and one on toxicity
substances in the food chain, and then several papers.

Q When you use that context, are you differenti-
ating papers that deal with different subject matters
or the way you go about preparing them?

A No, the differentiation in the report is a
more extended presentation of the work and archival

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type presentation, papers or journal, and is necessarily restricted in size.

Q For publication?

A Yes.

Q There was the approximately \$400,000 grant we talked about earlier, is that right, and it was completed in 1978?

A That is correct.

Q At that time did you have any other grant going for the U.S. EPA or was just simply a new one that you were working on currently?

A I had no other grants at that time.

Q 1981 you have another one coming out now, another three-year grant, is that right?

A Yes.

Q What is the request that was made there?

A The grant began '78 and extended to 1981 was modeling in toxic substances in the Great Lakes.

Q What does that specifically mean, modeling in toxic substances?

A It means to formulate the basic mechanisms that might be operative in the fate of toxic substances in the Great Lakes, to provide a basis and an input into the decision-making process.

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Q How do you use the term fate in that connection?

A Where the material ends up in physical and chemical environment.

Q Am I correct in assuming that that grant which is concluding now is totally separate from the request that Dr. Veith made of you in early 1969?

A Yes.

Q Was he aware that you were working on this grant at the time, as far as you know?

A Yes.

Q Has your work been reduced to a report and/or papers in this current project?

A It is in the process of being reduced to a report.

Q Of being what?

A Reduced to a report.

Q Have you published any of your tentative results?

A No.

Q When you prepare a report such as the ones we have been discussing here for EPA, do you need EPA permission to publish the results?

A No.

MR. HYNES: Excuse me. By publishing the report,

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you mean not just typing it, submitting it in an internal file?

MR. POPE: I am not talking about publication in the libel sense.

BY MR. POPE:

Q Approximately what was the cost of this three-year grant, '78 through '81?

A Again, about \$400,000.

Q Can you give me an approximation of how many other grants you have had from U.S. EPA besides those two?

A I think I mentioned we started grants with the EPA in the Great Lakes in the early '70s on eutrophication.

Q That was one that was completed in '78, was it not, or was that earlier?

A Yes.

Q Was that a specific grant, was that a series of grants, what was that, that was early 1970s?

A The first grant we had with EPA and Grosse Ile would have been 1972.

Q That would be the eutrophication in the Great Lakes?

A Yes, that's correct.

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Q Can you give me an estimate as to the amount of that grant?

A A couple of hundred thousand dollars.

Q Was that a two-year grant?

A Three-year project.

Q Was that completed in '75?

A Yes.

Q Following the completion of that study on the eutrophication in the Great Lakes, you then took on another grant from EPA?

A Yes.

Q Same laboratory?

A Yes.

Q 1975?

A In 1975 to 1978.

Q What was the subject matter of that grant, the same, on eutrophication?

A That is the grant that we talked about before, eutrophication with some beginnings in toxic substances.

Q That was the \$400,000 grant?

A That is correct.

Q Have you had any further grants or projects from the U.S. EPA?

A No.

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Q Have you had any other employment with the Federal Government and in the environmental area?

A Over what time period?

Q Right up to today.

A In my whole career?

Q Yes, sir.

A I spent my first 10 years with the Federal Government in 1956 to 1966. I was with the U.S. Public Health Service.

Q You did not bring a resume with you, did you?

A No.

Q Tell me what you did during that period of time.

A I was a sanitary engineer.

Q Were you stationed in one place?

A I was in New York and Philadelphia.

Q What did you do after 1966?

A It's been an academic appointment at Manhattan College.

Q You have been at Manhattan ever since?

A Yes.

Q Beyond the three grants you have talked about and your work for the U.S. Public Health Service from 1956 to 1966, have you received any other funds from

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the United States Government in the environmental area, whether they were designated as grant or employment or anything else?

A Over the period of time from 1966 to today and in varying consulting capacities, I would have received some funds, yes.

Q Can you describe what those were for us somehow?

A They would have been connected either with my work at Hydrosience and HydroQual, which I mentioned earlier, or as an independent consultant.

Q How many such consultations took place?

A I don't recall over the last 15 years. It's a little difficult to recall all of that.

Q Can you give me an idea of how much money you received from the Government for those various consultations?

A Over this 15-year period?

Q Yes.

A I would have to check my records.

MR. POPE: Mr. Hynes, that would be fine with me if you would agree to provide that information.

MR. HYNES: You are looking for how much he received himself from the Government individually, or, say, through

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MR. POPE: Directly, indirectly.

MR. HYNES: If the doctor can come up with that, that is fine. I don't have any problem with it. It is just what is available.

MR. POPE: We can do it by interrogatories if necessary.

MR. HYNES: And this is restricted to any work he did in the environmental area?

MR. POPE: I presume that is all there is, isn't there?

THE WITNESS: Yes.

Would you clarify your request again to me?

MR. POPE: Certainly. I would like to know, first of all, how many consulting projects since 1966 there were, some general description of what the consultation was and how much money was involved. That's all.

BY MR. POPE:

Q We have established, haven't we, that these were the only three grants you have gotten?

A Yes.

Q In the environmental area.

Now, let us go back to your telephone call from Dr. Veith. That was early in 1979, is that

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right, January, February, something like that?

A Yes.

Q What did he tell you as best you recall in that first conversation?

A As I recall, what he had asked was is there any way that one can make an estimate of the amount of PCB exchanging between Waukegan Harbor and the Great Lakes and Lake Michigan, and could I provide some assistance in describing a sampling program that would help to answer that question.

Q Did you ask him any questions with respect to what was known, why they wanted to do this, anything else by way of input from you to that conversation?

A I asked him what data was already available.

Q What did he tell you?

A He said that some studies had been made.

Q In the area of sampling studies?

A Yes, that there was some data on chlorides in the Harbor, some data on other substances in the Harbor that might be useful for a calculation.

Q Are chlorides as a substance commonly used in analyzing for this kind of movement?

A Yes.

Q What experience have you had in the use of

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chlorides as a device to measure transport?

A It is used quite extensively in estuary work to estimate transport in estuarian situations.

Q What estuarian situations had you used chloride for a transport report?

A A great variety dealing with estuary: Elware estuary, Potomac estuary; a variety of smaller estuaries; Chesapeake Bay system and so on.

Q So in your mind that was an important factor, that there was some data available with regard to chlorides, is that right?

A Yes.

Q Is there anything else you asked him or anything else you recall you said in that initial discussion?

A I asked him about the context of the problem.

Q What do you mean by that?

A Why was he interested in that particular question.

Q What did he say?

A He indicated that there was litigation, I don't recall, either under way or pending between OMC and EPA.

Q Is that it?

A And that that formed the concern for how much PCBs might be escaping from the Harbor into the Lake.

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Q Did he indicate why the presence of that litigation would make any difference of whether in fact there was transport of PCBs?

A The context was that if there was transport of PCBs from the Harbor into the Lake, the Harbor may be having an effect on the Lake.

Q Was it your understanding that what was the significance of that was how it would impact any proposed remedy?

MR. HYNES: Objection.

MR. POPE: You are objecting to my question of what his understanding was of the significance?

MR. HYNES: No, I think you are asking him to speculate. He was already asked what the discussion was with Mr. Veith.

If you have a specific question as to did they discuss that, that is one thing, but I think the question is misleading.

BY MR. POPE:

Q As you sit here today, Dr. Thomann, do you have any understanding of what the significance is of the projections as to whether or not there is any transport?

MR. HYNES: Significance in what regard? I think

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it is unclear.

MR. POPE: Significance as to why it matters.

MR. HYNES: To him?

MR. POPE: Sure, as far as he knows, from any source whatsoever, from any source, however he acquired it.

THE WITNESS: Why don't you repeat the question.

MR. POPE: Sure.

BY MR. POPE:

Q What is the significance in Waukegan Harbor of studying transport, whether or not there is transport?

A As I mentioned, I think the significance was is there any impact of Waukegan Harbor on the Lake.

Q How does that matter, as far as you know?

A I guess I am not -- matter if there is an impact, then people will get concerned about it in some sense. If there is no impact, nobody cares.

Q You understood your task to be a study ultimately to study whether there is any impact on the Lake from the Harbor, is that right?

MR. HYNES: You are again talking about the initial discussion with Dr. Veith in early '70?

MR. POPE: No, I am talking now.

BY MR. POPE:

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Q That is what ultimately your job came to be, is that right?

A No, no. Ultimately the job had several other aspects to it. That was certainly one of the principal aspects. The other aspect was to estimate the amount of PCB presently residing in the Harbor or the Ditch, the tendency for PCB to accumulate in the fish of the Harbor and to evaluate the effectiveness of various dredging alternatives.

Q What was the result of your initial conversation with Dr. Veith?

A He asked whether I would have a few days of time to put together some of my thoughts on a sampling program.

Q I take it you agreed to his request?

A I did.

Q What did you do next in regard to this project?

A I wrote up some of my thoughts and submitted them to him.

Q That was in written form, I take it, form of a letter?

Do we have that?

MR. FEATHERSTONE: No.

MR. POPE: Mr. Hynes, we were given by Jim White a

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bunch of materials that were represented to be Dr. Thomann's work papers.

MR. HYNES: I have never seen that letter and I don't know if it still exists.

BY MR. POPE:

Q Did you keep a copy of that, Dr. Thomann?

A I did.

Q Do you know where it is now?

A I would have to check my files.

Q Where are they?

A I have some with me, some at home.

Q Possibly at lunchtime, we can take a look.

MR. HYNES: I will see if it is here.

MR. POPE: I would like to make a request for it.

MR. HYNES: Sure.

BY MR. POPE:

Q Is this a one-paragraph letter or is it --

A No, it is about five or six pages.

Q What information did you have that formed the basis of your five or six-page letter on your initial thoughts on the matter? What factual information did you have?

A I had the early work done by Encotec and I had a report by Battelle, and as I recall, those were the

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principal data documents.

Q Where did you get those, or did you already have them when Dr. Veith called you?

A As I recall, they were sent to me.

Q Did you work with Dr. Veith before?

A No.

Q Did you know him?

A Not to my recollection. I knew of him. I might have met him once or twice.

Q To your knowledge, Dr. Veith or someone on his staff sent you the Encotec report and the Battelle?

A Yes.

Q Can you give me some estimate of how thick these documents were that you received?

A The Encotec report might have been a 15 or 20 pages, maybe another 15 or 20 pages of water quality data.

Battelle was 10 or 15 pages.

Q Those two reports are the ones that are referred to in your final report, is that right?

A That is correct.

Q There is only one Encotec report that you reviewed and only one Battelle report?

A That is correct.

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Q On the basis of those studies, you gave Dr. Veith your thoughts, is that right?

A That is correct.

Q Is there anything else you had available to you that went into making up this additional letter?

A Not that I recall.

Q I don't have the benefit of that letter. Can you summarize for me what your initial thoughts were?

A I laid out a sampling program, what I thought the station locations should be, the spacial extent of them.

As I recall, I did make some preliminary estimates of a mass of PCB in the sediment using Battelle, using those documents.

Q Anything else?

A I think that was the principal thrust of it.

Q How were you able to make an estimate of the mass of PCBs in the sediment?

A The Battelle report had some data on PCBs that they had summarized for the sediment.

Q You mean they had made some estimates?

A Right.

Q And you looked at those?

A Yes.

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Q Did you reiterate them, did you change those estimates, did you increase them, did you decrease them? What did you do?

A I did some of my own calculations based on that data. My recollection of the estimate that I made was that it was not that different from what Battelle had.

Q Can you give me a description of what methodology you followed to make a preliminary estimate of the amount of the mass of PCB in the sediment?

A Yes. At that point I simply took an estimate of the average PCB concentration in a given depth, over a given depth, and multiplied that by the solids at that depth and then accumulated it.

Q Is this simply in the Harbor?

A I am sorry?

Q Is this in the Harbor?

A Yes.

Q Only?

A I think I made an estimate, might have made an estimate on the Ditch or may have taken that estimate from Battelle directly.

Q What was the volume of the sediment that you included in your estimates?

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A You mean what was the actual numerical value?

Q How far down did the test go into the sediment?

A At that time I think there were some data that went down, maybe in the Harbor, several feet and in the Ditch, 5, 6, 7 feet.

Q Do I understand that your estimate was to average the findings of PCBs in each of those samples and multiply that by the volume?

A That is correct.

Q When you say volume, what are you referring to?

A I am referring to the volume over a certain depth.

Q And the depth being the length of the cores taken at the samples?

A No, I didn't have access to the cores. I only had access to the summary of data presented by Battelle.

Q Showing how far down?

A Yes.

Q I suppose if they went 5 feet down, the way to find the average of PCBs would be to multiply that figure by the volume to a level of 5 feet into the sediment, is that correct?

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A Yes.

Q Were there, as far as you recall, any figures showing the volume of the North Ditch?

A Yes. As I recall, yes.

Q Did your estimate include different levels down for the North Ditch as opposed to the Harbor?

MR. HYNES: Objection. It is unclear what you mean by different levels down.

BY MR. POPE:

Q Did you use the same level, that is from the sediment down 5 feet, 2 feet, 1 foot, whatever it was? Did you use the same level down in the North Ditch as you did in the Harbor in making that estimate?

A I don't recall exactly the computation I made at that early preliminary stage of the North Ditch, but my recollection would probably be that it wasn't the same depth.

Q Different depths at different places?

A Yes.

Q Was it your assumption in making that estimate that there were little or no PCBs below the levels that those samples were taken?

A That is correct.

Q Was that an assumption based on your experience

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in the area, the area of environmental engineering?

A That was an assumption based on my experience in that particular geographic area.

Q In the area of environmental engineering, the work you had done previously?

A Not necessarily. It was simply based on the fact that there weren't any additional data down below the last recorded level at which PCBs were measured.

Q Was that one of your suggestions to Dr. Veith that there should be further data taken at lower levels?

A I think I did suggest that course be taken, yes.

Q To what levels?

A I didn't specify, as I recall, but I would have to check what the maximum level was.

Q Your best estimate as you sit here today, would it have been in excess of 5 feet, what your recommendation was?

A It was probably pretty close to 5 feet in the Harbor at that time.

Q Was it your feeling initially that there was no need to go any deeper than 5 feet in terms of measuring PCBs in the sediment?

A I frankly don't recall what my thinking was

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at that very early preliminary stage in suggesting that course be taken.

As I said, I don't recollect whether I had specified a maximum depth to which the cores should be taken.

Q Is there any kind of standard depth based on your past experience?

A No.

Q Which cores should be taken?

A No.

Q At any point in time, did you recommend that cores be taken beyond 5 feet in depth?

A I don't recall any specific time that I recommended that.

Q Is it your feeling that it was not necessary to take cores down into the sediment whatever length you want beyond the 5-foot range?

A No, I think that would depend on an assessment of the individual area as to whether there is a judgment that in order to estimate the total amount amassed in a particular region, you might have to go below 5 feet.

Q Why don't we talk about Waukegan Harbor and the North Ditch.

Is it your judgment there was no need to

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measure below 5 feet or to evaluate the amount of PCBs that are present?

A On the North Ditch, I think it would probably be advisable in some of those areas to evaluate PCBs below 5 feet.

Q Why?

A Because my recollection is that the preliminary data indicated there were some PCBs even down to 7 feet.

Q Is that the only place that in your opinion there should be cores taken greater than 5 feet?

A No. I think that the inner area of the Harbor, Slip 3, for example, that cores of depth to about that level or maybe even greater would be advantageous.

Q You never suggested such cores be taken during your work on this project, is that correct?

A As I indicated, I suggested that cores be taken. I don't recall exactly what the depth specified.

Q Were they?

A Yes, a variety of cores were taken.

Q At your recommendation?

A I don't know that I made that recommendation of cores to be taken.

Q Did you ever see any results beyond 5 feet?

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A In Waukegan Harbor?

Q In the North Ditch and the surrounding area.

A Yes, I think I did.

Q Who took those samples?

A As I recall, I saw that information in a report by Mason and Hanger.

Q Did you include that data in your evaluation, in your final report in this project?

A Now we're talking about the final report, not the preliminary report?

Q Yes.

A Yes.

Q In what way did you take that into account?

A Specifically in attempting to estimate the mass of PCBs in the sediment of Waukegan Harbor in the North Ditch.

Q To what level were those cores taken?

A I don't recall. I would have to check.

Q To what level does your final report take into account what level of sediment to be taken into account to estimate the total amount of PCBs?

A In Waukegan Harbor my recollection is about 5 feet and maybe in some cases a little greater.

In North Ditch, on the order of 5 feet

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and greater.

Q I have to ask you again how your final report took into account this data from Mason and Hanger which went beyond, deeper than that.

A Let me have the question again.

Q Sure. A minute ago I asked you if you took into account the Mason and Hanger data which were core samples beyond 5 feet. I still would like to know how you took that into account.

A In a general way, the area was divided into a series of reaches and depths and the concentration, average concentration was measured for each of those and multiplied by volume down to whatever depth we had available from those cores.

Q Were your initial recommendations followed with respect to station sampling, station locations for sampling?

A By and large, yes.

Q What does by and large mean?

MR. FEATHERSTONE: Could I have that question and answer read back?

(Record read.)

BY MR. POPE:

Q The question is what does by and large mean?

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A I think there were several stations further out into the Lake that were not occupied in the grid stations that I suggested, but the stations that were suggested in the Harbor and the area immediately surrounding the Harbor were utilized.

Q What information did you need in order to make those recommendations with respect to the physical characteristics of the Harbor, depth of the sediment, those kinds of considerations?

A In the information that was essentially contained in the report that I mentioned earlier, a map of the area and my general understanding of what one would need to address the kinds of questions that were being asked.

Q You had not been physically at Waukegan Harbor at that stage, had you?

A No, we're at the point --

Q Where you made your recommendation with respect to the sampling location?

A No, I had not been.

Q Had you any knowledge as to how the Harbor was used?

A Not beyond what was in the report I had in hand.

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Q Did you have any information with respect to annual rainfall or other data relating to climate or precipitation?

A In Waukegan Harbor area specifically?

Q Yes, sir.

Q No, I had no occasion at that point to seek that information out.

Q That was not significant to the setting of station issues?

A At that point, no.

Q Did you have information in the Encotec and Battelle report that showed you how deep the water was in the Harbor and outside the Harbor?

A Yes.

Q That was significant, I take it, to set up sampling locations?

A The depth, to some degree, yes.

Q Was there anything else which is specific to the particular Harbor where you are going to set up such a sampling location which you needed to have with regard to setting where the proper place for those sample locations would be?

A Again, the specific geometry of the Harbor, how it relates with the Lake itself and its orientation

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with respect to the Lake.

Q Was it significant or is it significant to know the topography of the surrounding land area?

A At that point, not terribly significant.

Q It is not in the setting of the sampling locations?

A No.

Q If I understand correctly, this letter you initially sent to Dr. Veith, this five or six-page letter, contained your recommendation for the location, places for sampling?

A Yes.

Q And your initial estimations as to the amount of PCBs in the sediment?

A Yes.

Q Anything else?

A That was about it.

Q Those initial estimates of PCBs in the sediment were roughly the same as those provided in the Battelle documents that you were provided?

A As I recall, right.

Q What was your understanding with respect to how long the sampling process was going to be in place?

A I don't think I had an understanding of how

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long it was going to be in place. I just made my recommendation and gave, turned it over.

Q Is it true the longer the sampling locations are in place, the more accurate the overall report will be, all things being equal?

A Yes, in general.

Q In your initial discussions with Dr. Veith or in your letter to him, was there any understanding, was there any understanding you had as to how long the sampling was going to take?

A I think that I talked about some weekly sampling intervals, some daily sampling intervals.

Q You say you talked about it. Did you tell Dr. Veith this would be necessary?

A Yes, to my recollection.

Q I take it when you say necessary, you mean necessary to the integrity of the report?

A That is correct.

Q Is the location of the daily sampling intervals different than the weekly sampling, generally speaking?

A As I recall, I suggested certain stations be more intensely sampled than others, simply from the point of view of effective allocation of resources.

Q Did you start off your work on this project,

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at least after you read the two initial reports, with the assumption that the great percentage of PCBs were located in Slip 3 of the Harbor?

A As I recall reading those reports, yes, that was an assumption.

Q Did the recommendations you made to Dr. Veith for sampling consist of a request that samples be taken at the top and bottom?

A Yes.

Q What were the variables to be sampled, or what were the chlorides, PCBs and those kinds of elements? What kinds specifically, do you recall?

A I think I suggested chlorides, I suggested suspended solids in several size classifications. I suggested --

Q Four specifically?

A Yes. I suggested PCBs also in several sized classifications; water temperature. I think that was about it.

Q I take it these are recommendations that were followed?

A Yes.

Q Who was to do the sampling?

A I did not recommend how to do the sampling, if

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that is what you mean.

Q Did you discuss with Dr. Veith either orally or in writing what kinds of quality assurances would be needed to be made with respect to sampling?

A No.

Q Wasn't that an important consideration in the accuracy of your overall report?

A It is.

Q Were you relying on Dr. Veith to assure the accuracy of these samples?

A Yes.

Q At any point in time, did you review with Dr. Veith or anybody else the procedures that were employed to assure quality assurance of those water quality samples?

A Not in detail, no.

Q Not in detail?

A Not to the point where I sat with chemists such as Dr. Veith and went over all of the techniques involved in evaluation of PCBs in a particular situation like this, but in general, relying on the quality control that I know Dr. Veith is very responsible for.

Q You left that area up to him?

A Yes.

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Q Who ultimately took the samples, do you know?

A One of the samples or one crew was the Cranbrook Institute of Science. And the samples were also taken by Argonne Labs.

Q Have you worked on studies where Argonne has taken the samples?

A No.

Q How about Cranbrook?

A Cranbrook, we had obtained data from them before on our earlier work on eutrophication.

Q Where is their office?

A Where is their office? In Detroit.

Q Did you discuss with the representative of Argonne or Cranbrook their quality assurance procedures in connection with the sampling or was that something you left up to Dr. Veith?

A No, again, the same procedure was followed.

Q That is, you left it to Dr. Veith to worry about that?

A Well, again, I would say the same procedure was followed.

Q I am just trying to clarify what you mean.

A By that I mean the details of quality control, I did not evaluate.

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Q Did you evaluate any of them, or did you leave that to Dr. Veith to evaluate it?

A To the extent that when all the data comes together, I make an assessment of whether the data hangs together, looks reasonable, that there is no reason to suspect that it is out of line in which case I would ask for some clarification.

Q As to the procedures employed, you don't do any supervising or review of the people doing the samples, is that correct?

A No.

Q No, that is correct?

A It is correct that I don't supervise any of the analysis of data.

Q You made these additional recommendations to Dr. Veith in this letter that Mr. Hynes is going to try and provide us with.

What was the next thing that took place in connection with this assignment?

A I think the next thing was the request to evaluate the data as it was collected for specifically making an estimate of the flux out of the Harbor mass of PCBs in sediments and so on.

Q Did this take place in the same time or the

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same time period or was it a later point in time?

A It was a later point after my submission of that.

Q After you submitted the letter to Dr. Veith, you did not have any contact with him during the next several months, would that be a fair statement?

A I might have had some contact with him, yes. He might have asked me for some oral clarification of what I meant in my recommendations.

Q This preliminary letter that you sent off to him, did he ever call you up and say, "Great job. We're going to follow it," or --

A I think the understanding was that there was going to be a sampling investigation and that my input was to help round that sampling investigation out.

Q Did you submit a bill for your time in preparing those recommendations?

A I did.

Q Did that include time you devoted to estimating the total mass of PCBs in the sediment, is that correct?

A That is correct.

Q You still had not met with Dr. Veith personally, had you, on this project?

A I might have met him personally right at the

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end of the submission of this letter in a trip to Chicago.

Q Let us think about that for a minute.

Did you give Dr. Veith this letter, this five or six-page letter?

A I mailed it to him.

Q Thereafter do you have a recollection of meeting with him and talking about it?

A I think so, yes.

Q That was here in Chicago?

A I think so.

Q Who else was present, to the best of your recollection?

A Various members of the EPA.

Q Anybody you know?

A Prior to that time?

Q Yes, right.

A No.

Q Is there anybody you can identify today?

A It would have been Howard Zar, I think was there, Ed Didomenico, Gil Veith. That's who I remember.

Q Is that the point at which it became clear to you that your report had been accepted and in essence your recommendations were going to be followed?

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A It became clear to me that my report was part of a larger process and the degree to which my report was accepted, I think, became a little clearer at that point.

Q What was Mr. Zar going to do as far as you understood?

A Supervisory capacity of the work.

Q How about Mr. Didomenico?

A The same.

Q How did it become clear that your work was part of a larger effort?

A I would become aware of the fact that other work might have been going on.

Q Such as?

A I think at that point, and I am not clear exactly on the chronology of the whole thing, but at that point there might have been the first step towards evaluation of additional data from the sediment or measurements of the additional PCBs in the sediment. So I began to get a sense that there was some additional work being planned.

Q The evaluation of this additional data, was that evaluation of the additional sampling you recommended be initiated?

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A No, I think just additional sampling, period.

Q How was that being done, as far as you know, by whom?

A Well, at that point I don't think I even knew all the people who might have been considered for that work, but subsequent to that I understood, I knew that Dave Armstrong had done some work and samples were then collected by ERG, Environmental Research Group.

Q Anybody else?

A That is all I can remember.

Q These reports were not made available to you at this meeting, were they?

A I don't think there were any reports even at that stage.

Q At this meeting were you asked to assist in the evaluation of additional data?

A Yes, yes.

Q And you agreed to?

A Yes.

Q By this point in time, had you worked with anybody else on this project other than Dr. Veith?

A I might have had some conversations with Ed Didomenico from EPA relative to the possibility of further evaluation of data as it came in.

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Q In telephone conversation?

A Yes.

Q Did he call you or you call him?

A He called me.

Q Was that the first time you talked with him?

A Yes.

Q Is he the one that suggested the meeting in Chicago?

MR. HYNES: Objection. It is misleading that someone suggested. You have not identified or asked who set up the meeting in Chicago.

MR. POPE: I will be happy to do that, Mr. Hynes.

BY MR. POPE:

Q Can you tell us how you came to this meeting in Chicago?

MR. HYNES: Okay.

BY THE WITNESS:

A I frankly do not recall what the actual details of how it came about, but I assume that --

MR. HYNES: Doctor, don't assume. If you don't recall, you don't recall.

BY THE WITNESS:

A I don't recall.

BY MR. POPE:

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Q Were you here for some other purpose?

A No.

Q You came out here on this project?

A Yes.

Q I take it it wasn't your idea?

A Yes.

Q Yes, I take it correctly?

A Yes, you do.

Q At this point in time, this meeting, are we talking about March approximately of 1979?

A I really don't recall, but it would have been around that time.

Q Had you done any work with anyone else beyond EPA on this particular project?

A No.

Q Had you had any assistance from your staff?

A No.

Q Had anyone at Hydroscience done any work on this project?

A No.

Q Had you discussed the matter with your colleague, Mr. Dituro?

A At this point, no.

Q At that point, was he studying the effect of

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PCBs on sediment?

A No.

Q What was he studying with regard to the Great Lakes, generally?

A He was studying the transport of substances in the sediment at that point, not including PCBs.

Q What was your means of compensation by EPA, this early part of this project?

A I was paid a daily per diem rate.

Q What was that rate?

A I think it was \$300 a day.

Q Has it gone up today?

A You mean for Government work?

Q For this project.

A This project, I do understand the HydroQual as a principal consultant, my fee at the present time and my per diem rate at Hydroscience is equivalent to \$350 a day.

Q I don't mean to dwell on it, but you mean equivalent, is that what comes to you?

A Yes.

Q The charge is higher because it runs through the company?

A That is correct.

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Q Is it true that following this meeting in Chicago, you had no further contact for the next several months?

A I don't recall exactly how long there was no further contact, but it was around that order of weeks to months.

Q What was the next thing you did on this project?

A The next thing I did was begin working with Hydrosience on this particular project that we talked about.

Q Namely, Exhibit No. 1, the exhibit that has been marked, the Task Plan?

A That is correct.

MR. POPE: Why don't we take a break.

(Brief recess had.)

(Thomann-OMC Deposition

Exhibit No. 2 marked for

identification, 9/17/81, TLU.)

BY MR. POPE:

Q Dr. Thomann, I will hand you a document which we have had marked as Thomann Deposition Exhibit No. 2 for identification, which is a 14-page document which Mr. Hynes has been kind enough to provide us with.

Dr. Thomann, you are familiar with that

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report, are you not?

A Yes.

Q It is dated March 1979?

A Yes.

Q Could you tell me what it is?

A This is the report I was referring to earlier that I submitted in response to Dr. Veith's request.

Q Did you maintain a copy of the cover letter that went with that?

A I frankly don't recall if there was a cover letter.

Q This report, Exhibit No. 2, contains your estimates of PCB mass in the sediment as well as your recommendations for sampling, is that correct?

A Yes.

Q There is a reference to a paper by Professors Murphy and Rzeszutko, is that right?

A Yes.

Q Is that a paper that you reviewed and used in the preparation of this document?

A Yes.

Q Is there any other than the one that is indicated there that you used in the preparation of that report?

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A Not to my recollection, no.

Q Table 1, if I understand correctly, as on Page 2, is your calculation of estimated amount of PCB in the sediment, is that right?

A Yes.

Q Your reference to PCB shows a (1248), is that right?

A Yes.

Q Where did that information come from?

A I don't recall exactly.

Q Am I correct that is a reference to Aroclor 1248?

A Yes.

Q Is it your recollection it came out of either the Encotec report or the Battelle report?

A That would be logical to assume, yes.

Q Do you have any recollection to the contrary?

A No.

Q Did anybody ever tell you that what you were focusing on in Waukegan Harbor in the North Ditch was Aroclor 1248?

A You mean orally?

Q Any way it happened.

A At this point I don't recall.

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Q How about right up today?

MR. HYNES: Right up to today, what he was told in 1979?

MR. POPE: As to the focus -- no, no.

MR. HYNES: Are you talking about directly in the focus of this initial work?

MR. POPE: The good doctor has told me he cannot remember where that information came from at all in that March 1979 report.

MR. HYNES: Fine. What is the question?

MR. POPE: Now we have a different question.

BY MR. POPE:

Q The question is has anybody told you that you should focus your analysis in connection with Waukegan around the assumption that we are dealing with Aroclor 1248 here?

MR. HYNES: Again, you are not limiting yourself to just the '79 period; any time, any work he has done, is that correct?

MR. POPE: Yes.

BY THE WITNESS:

A Yes, I have been told that. I read it. As I mentioned earlier, I think it is logical to assume that this information is available and in the literature

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that I had available, so yes, I have been told that.

BY MR. POPE:

Q Where was that information available in the literature that the substances that you were investigating in Waukegan, both in the Harbor and the Ditch, was 1248 as opposed to some other form of Aroclor?

A Well, we are talking beyond March '79. We are talking right up today.

Q I take it you had no recollection of how that number got into your March '79 report, is that right?

A No detailed recollection, that's right.

Q You have no general recollection, do you?

A Well, it appears there, so I didn't make it up.

Q I didn't suggest you did.

You have no recollection as you sit here now where that number came from, that number 1248 came from, is that right?

A That is correct.

Q Let us set aside the March '79 report and let us talk about what you remember reading in the published literature with respect to Aroclor 1248 being the PCB substance that you are focusing on in Waukegan.

A I recollect, for example, a book on chemistry

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of PCBs in the Hudson River, reference to Aroclor 1248 being presently used in hydraulic fluids.

Q What was the date of that book, do you know?

A I think it is referenced in the report.

Q Is that the 1960 -- what is the name?

A Hutsinger, H-u-t.

Q I don't see the report you are referring to. It is not in your final report.

A Well, probably the mid-'60s. That book essentially, to my recollection, does make mention of the fact that hydraulic fluids, 1248 is a principal Aroclor used in hydraulic fluids.

Q Is there any other basis for your assumption?

A I think, first, maybe one of the first times that I recall it was in a paper by Marion, I think referenced in there, I talked about it, and in other documents that I have seen over the last two years.

Q Have you ever asked anybody at the Government for the makeup of the hydraulic fluid involved at Johnson Motors, either U.S. EPA personnel or any of the lawyers?

A Chemical makeup?

Q Yes.

A What do you mean by makeup?

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Q Chemical.

A No, not specifically.

Q Have you ever asked them for the Aroclor makeup?

MR. HYNES: Do you mean by Aroclor makeup, different than chemically, what Aroclors are contained in it?

MR. POPE: Sure. I presume the doctor is deriving some distinction between the question and I am happy to follow through.

BY THE WITNESS:

A I don't recall questioning the makeup.

MR. POPE: I will ask again.

BY MR. POPE:

Q Have you ever asked anybody connected with the Government, either U.S. EPA people or the lawyers involved, which types of Aroclors were in the various hydraulic fluids that were purchased by Johnson Motors?

A Yes, I probably did.

Q Who did you ask?

A I don't recall exactly who I might have asked, but somewhere along the line I probably asked somebody what Aroclor are we talking about.

Q Assuming you probably asked somebody, I take

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it it wasn't one of the lawyers, is that right?

A Yes.

Q Can you recall what they probably told you in response to that probably question?

A They said it was probably 1248.

Q That was the extent of your investigation into the subject?

A By and large, yes. I don't recall any further detailed investigation into that question.

Q Have you ever determined whether there were any significant chemical differences amongst the various Aroclors as they would affect your work?

A Yes, I have determined that some of the Aroclors might be made differently than others.

Q Have you taken any steps to determine how the Aroclors we are dealing with from Waukegan would fall into that range of activity?

A I don't understand that at all.

Q You have just said that you understand that certain Aroclors react differently from other Aroclors, is that right?

A Yes.

Q Where is the Aroclor that we are dealing with fall within that spectrum?

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A Again, I don't understand the question. They behave differently from a variety of points of view.

When you say where does the Aroclor in Waukegan Harbor fall, you will have to be a little more specific with respect to what properties or with respect to what mechanism.

Q With respect to your work on the transport, the potential transport, do they have any different characteristics as far as you are concerned?

A The Aroclors?

MR. HYNES: You are talking generally the Aroclors rather than the specific ones in Waukegan Harbor?

MR. POPE: Yes.

BY THE WITNESS:

A Yes. For example, from the point of bio-accumulation of PCB, the Aroclor certainly makes a difference on the extent of uptake on bioaccumulation.

BY MR. POPE:

Q Is there any other way that the different Aroclors would impact your work?

A Yes. Aroclors would also behave differently with respect to evaporation.

Q In what sense?

A That the higher more volatile Aroclors would

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volatilize more readily from the water than the less volatile Aroclors.

Q Higher, you mean higher chlorine?

A Not necessarily, no.

Q What do you mean?

A Generally associated with the higher solubility of the Aroclors which would tend to be the more lower Aroclors.

Q Are there any other ways that these various characteristics would affect your study?

A The other way, though this isn't detailed, would be generally in connection with the degree to which Aroclors adsorb on the particular matter.

Q How do the Aroclors break down in that category?

A The higher Aroclors would generally adsorb more to particulates than lower Aroclors.

Q Any other areas?

A That's about it.

Q Am I correct that these three characteristics, you did all your work on the assumption that we are dealing with Aroclor 1248, is that right, as the form of PCB?

A We actually never really had to make that assumption. We worked with the data that we had.

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We never really relied on the particular characteristic of an Aroclor, so in a sense, we never really had to make that assumption.

Q I see.

In your work on bioaccumulation, is it your judgment that it does not make any difference what kind of Aroclors there are in the Waukegan Harbor?

A No, it simply means we didn't have to be that specific about the Aroclor.

Q Is your answer the same with regard to evaporation?

A Yes, that's correct.

Q And adsorption of the particulates?

A Yes, that is correct.

Q Did you ever suggest to anybody at the U.S. EPA or any of the lawyers that these characteristics, at least in these three areas, would differ depending on what Aroclor was involved?

A I might have done that sometime in the past. In the more recent work, given the data at hand, the ability to distinguish those differences in the environmental situation of Waukegan Harbor is rather difficult.

Q Does your report refer to the differing effects of those three characteristics based on the type of

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Aroclor involved?

A Which report?

Q Any of the reports you have done with U.S. EPA and in connection with this case.

A Yes, in some instances I have made some statements and some estimates depending on lower Aroclors versus nigher Aroclors.

Q Which reports were those?

A In my final report or our final report, in the comparisons, for example, inputs from Waukegan Harbor to the Lake as a whole; made some comparisons between the lower Aroclors from the Lake or lower Aroclors or 1248 from the Harbor.

Q What section of your report would that be in?

A That would be under the section entitled Significance of Present Discharges to the Lake.

Q I take it you are referring specifically to Page 98?

A Yes, and following.

Q The reference to the Murphy and Rzeszutko article in 1970, that is the same one you referred to here in the March 1979 report, is that right?

A Yes.

Q In that paper, is it true that they give a

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range approximately 50 percent PCBs in the form of lower Aroclors such as 1260 and 1242?

A Yes.

Q What is that referring to? Are they referring to 50 percent in Lake Michigan?

A No, 50 percent of the PCBs in the precipitation was in the lower Aroclors.

Q Turning once again from whence we got side-tracked to Deposition Exhibit 2 for identification, specifically Table 1, your estimate of PCB mass, am I correct that these are the calculations that we talked about earlier whereby you averaged the test results that were available and multiplied by volume?

A That is correct.

Q Would the 0.2 be the average of the samples?

A No, the 0.2 is the result of multiplying the water concentration by the volume of water in the Harbor.

Q Water concentration in what?

A Micrograms per liter times the volume of the Harbor water in liters.

Q In order to determine how much water there is in the Harbor, is that right?

A No, to determine what the mass of PCBs is in

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the water of the Harbor, which is .2.

Q .2 measured in what?

A Kilograms.

Q .2 kilograms is a measurement of the amount of PCBs in a column of water in the Harbor, is that correct?

A No. It is an estimate of the mass of PCBs in the volume of water of the entire Harbor.

Q The entire Harbor has .2 kilograms?

A In the water.

Q Where does that come from?

A As I explained, that comes from a multiplication of concentration times the volume.

Q Based on the sampling that you had available at that time?

A Correct.

Q What is the 26,000?

A That is the estimated, at that point, estimated mass of PCBs in the Harbor sediments.

Q Computed the same way as we referred to except for sediments?

A Except for sediments.

Q Are those work papers attached here?

A No.

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Q Did you prepare work papers?

A Yes.

Q Where are they?

A I think they are in the other documents that you have.

Q Have you made these available? We will look them over at lunchtime.

In doing this estimate, did you assume that by taking the average of the various samples, you were achieving a realistic estimate of what was in various places in the Harbor?

A At this point it was really an attempt to arriving at some very preliminary feel or understanding of what the order of magnitude was. That is all it was intended to do.

MR. POPE: I don't know if that is a yes or no to my question.

Please read the question.

(Question read.)

BY THE WITNESS:

A My answer was that in this stage of the analysis, the attempt was to try and establish relative orders of magnitude. If that is what you mean by realism, yes.

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BY MR. POPE:

Q I would have thought the answer was no.

You weren't really assuming that because a certain finding was made in one place and a certain finding made someplace else that the average of those would give a good evaluation of what was in between them, would you?

A Again, at this point it was really an attempt at evaluating the data as it stood before me, making some calculations, and I have to check my notes again on specifically what calculations I made. But wherever possible, I tried to avoid situations such as you described.

Q How did you do that?

A By simply estimating on the basis of information available what the approximate concentrations of PCB might have been at different reaches.

Q Were you aware of any information with respect to physical characteristics of PCBs that would indicate to you that an averaging process such as you described would not be scientifically correct?

A At that point, no.

Q You were not aware of the existence of hot spots in terms of measuring PCBs, were you?

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A I was aware of these instances of hot spots. I was not aware of the incorporation of those hot spots into the averaging procedures as necessarily being the wrong way to go about it.

Q Are you now aware of that?

A Yes.

Q Would it be fair to say that based on your current knowledge, the methodology you used here in Table 1 would not produce an accurate estimate of PCBs in the sediment?

A That is correct.

Q The reference in Table 1 on Page 2 to Removed by Dredging, could you tell me what that refers to?

A That was an estimate of the mass of PCBs that might have been removed by Harbor dredging.

Q U.S. Corps of Engineers, you mean?

A Yes.

Q Where did that information come from?

A As I recall, from the Battelle report.

Q The second to the last line says Total Discharged (at 10 percent of purchase), where did that information come from?

A I think that came from the Murphy report.

Q The published article?

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A Yes.

Q What was that referring to, at least as you used it here?

A I am sorry, what was it referring to?

Q Yes, what does 10 percent of purchase mean?

A It means that in that published article, an estimate appeared of how many kilograms of PCB had been purchased and this is 10 percent of that number purchased.

Q Did you do any investigation to determine the accuracy of the estimate that appeared in the Murphy article?

A At this point, no.

Q Let me ask you this:

Did you have any way of knowing at the time you prepared this report whether industry-wide practice would support the notation of 10 percent, the amount of hydraulic fluid purchased?

A No.

Q Is there any reason why you included that in your Table 1?

A Only that it appeared in the literature and provided some reference point to compare it to the other estimates of mass.

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Q Then you have a final line that says Mass Unaccounted For, don't you?

A Yes.

Q What you are doing here is taking a 10 percent of purchase figure from the Murphy article and then computing what you are estimating to be still in the sediment, is that right?

A No. All it was was an estimate of if 10 percent of the purchase had in fact been discharged and this early calculation indicated that there was a substantial amount of mass unaccounted for.

Q What was the purpose of doing that calculation?

A To see if I could get a mass balance of what was in there now as what had been reported anyway of being discharged.

Q Was the purpose in doing Table 1 or your purpose in reporting it to Dr. Veith to indicate that your preliminary estimate was that there was 300,000 kilograms of PCB that might have slipped off into the Lake?

A That was a possibility, yes.

Q And the total basis of that possible estimate was based on 10 percent of the purchase figure which came out of Professor Murphy's article, is that correct?

A Correct.

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Q Did you tell Dr. Veith that this Table 1 was suspect in your mind?

A Yes.

Q You did?

A Yes.

Q How did you tell him that?

A I told him that things don't seem to balance and I have a mass PCB that I can't-account for.

Q Did you tell him in the report itself that Table 1 was just a rough estimate and it was not scientifically accurate?

A I think I discussed the range of uncertainty associated with this kind of estimate.

Q This report, Table 1, was never intended to be a scientific estimate of PCB, was it?

A Well, it was the first preliminary engineering estimate, yes.

Q Did you present to Dr. Veith with any degrees of confidence you felt with any of those figures in Table 1?

A I think orally I indicated there was a considerable amount of variability that one might associate at this stage or at that stage in the work.

Q Where was the variability, the part below the

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line?

A Yes. Again, the uncertainty in the mass unaccounted for.

Q At this time, March of 1979, had you available to you any studies of fish accumulation of PCBs in Lake Michigan?

A '79?

Q March.

A Michigan, to my recollection, I did.

Q Did you consult those studies with respect to this overall question?

A No.

Q Page 3 of your report refers to the need in doing modeling to establish sampling out to 8 kilometers from the mouth of the Harbor, is that correct?

A Yes.

Q Where did you pick that as a distance?

A Just as a general guideline on the basis of my experience that the spacial, maybe the approximate spacial extent of dispersion or diffusion out from the Harbor into a lake.

Q Did you have at that time any information about any testing that had been done in the Lake?

A In Lake Michigan?

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Q Yes, for PCBs.

A Yes. That coincided with some of the work that I discussed earlier on toxic substances modeling in the Great Lakes as a whole.

Q Did you note the source attributed in the Murphy report to the amount of purchased?

MR. HYNES: I don't understand what you mean by note; in the report?

BY MR. POPE:

Q No, note to yourself?

A I don't remember.

Q Do you know what the basis of that estimate was or whether there was any attribution to any source?

A I would have to check the report again to see what their source was.

Q You don't recall one way or the other whether that was indicated?

A No.

Q Did you ever talk to Professor Murphy about that?

A No.

Q With respect to Pages 3 and 4 and 5 of your report, that sets forth your sampling recommendations, is that correct?

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A Yes.

MR. HYNES: Look at it before you answer, please.

BY THE WITNESS:

A Yes.

BY MR. POPE:

Q To your knowledge, were those recommendations followed?

A Not in total but in general.

Q In what way were they not followed?

A I think it was not feasible at the time anyway for them to mount a sampling program early enough after March to get in the water by April as I suggested, and the extent of the surveys beyond the May period, that is the June and July, I don't think -- those surveys were not conducted, to my recollection.

Q Does reviewing that report refresh your recollection as to whether you made any suggestions as to how long the testing program should be?

A Yes, it refreshes my memory and I see that I suggested several months.

Q How many?

A April, May, June, July, four months.

Q May --

A I'm sorry, three months, May, June and July.

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Q Was that your professional judgment that that would produce sufficient data so that you could form statistically significant conclusions?

A It is a difficult question. One normally defines the sampling programs without any rigorous statistical theoretical structure, but tries to incorporate one's experience on how many samples might be necessary for a "reasonable" estimation or development of a model.

This was my estimate at the time.
The fact that the surveys were not all conducted doesn't necessarily mean that the results are not reliable.

Q The more data you have, the more reliable the results are, is that right?

A More or less.

Q What significance was there in your mind to the summer period of time as opposed to the winter period of time for the sampling?

A No particular significance at this stage of the evaluation. Summer was suggested as the survey period that could be carried out as soon as possible after this had been submitted.

Q Was there a minimum amount of sampling that in your opinion was necessary to produce professional

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or statistically significant results?

A That's very hard --

MR. HYNES: You mean minimum at the time of this report?

MR. POPE: At the time he's giving his recommendation, sure.

BY THE WITNESS:

A It is very hard to answer a question like that with respect to a minimum. My answer would generally be that any additional data collected at that point would increase the understanding and unraveling of what was happening.

BY MR. POPE:

Q You could not have done a modeling based on the information that was available as of March 1979 that showed transport, could you?

A Certain aspects of the data that was available at that time in fact we did use in our model construction.

Q Was it sufficient in your opinion to give rise to your being able to give a professional conclusion?

A No.

Q How much additional data was needed?

A At this point in time, this was my suggestion.

Q Exhibit No. 2?

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A Yes.

Q Anything else with respect to the sampling that was not followed from your recommendation?

A I noticed I had suggested here that some information be taken on the inputs into the Harbor.

Q That was not done?

A I don't recall whether direct measurements were made of that information from the industrial sources. To my recollection, no.

Q What was the purpose of suggesting that that data be collected?

A Just to ensure that an input of any of the substances that are listed here are not missed.

Q Namely, PCB?

A PCB, chlorides, solids and so on.

Q Do you know why that wasn't done?

A No, I don't.

Q Did you ever suggest to Dr. Veith that that wasn't very important?

A That it wasn't very important?

Q Yes.

A I might have suggested later on that we could analyze specifically, for example, chloride data without any specific detailed information on inputs, and then

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later also obtained information that indicated the present inputs at that point in time were negligible of PCBs.

Q Where did you acquire that latter information?

A Later on in the work of the final report.

Q From what sources did you acquire that information?

A EPA.

Q They advised you there were no other sources of PCBs, is that right?

MR. HYNES: Objection, mischaracterizing what he said.

MR. POPE: That is what I am asking. I am not trying to mischaracterize it.

BY MR. POPE:

Q Is that right or wrong?

A Why don't you ask me again.

Q Why don't you tell me what it is that you later received information on with respect to PCBs.

A Yes. Information on the sampling that had been conducted by the State on the various outfalls from the area on PCBs.

Q You were advised by EPA the State had done sampling of various other outfalls in the Waukegan

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Harbor area, is that right?

A Of the outfalls in the Waukegan Harbor area.

Q And those had shown that PCBs were negligible?

A At this point, yes.

Q Was that a written report?

A No, that was sampling documents, sampling search that EPA provided to me.

Q Approximately when was that done?

A That would have been 1980.

Q Is there anything else in connection with your sampling recommendation in Exhibit No. 2 that were not followed?

A The spacial extent of open lake stations was reduced in the final sampling program.

Q What do you mean by spacial extent?

A The sampling grid did not extent out 8 kilometers.

Q How far out did it extend?

A Just a kilometer or so.

Q Was that change discussed with you?

A Yes.

Q When was that discussion held?

A Sometime after submission of this document.

Q Who had the discussion with you?

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A I don't recollect exactly who in EPA, but it was somebody in EPA.

Q That includes a lot of people. Is it somebody --

A Of the people that I dealt with.

Q The lab at Grosse Ile?

A No, it would have been the people that I dealt with that I mentioned earlier: Gil Veith, Didomenico, Howard Zar.

Q They told you that the extent of the sampling was going to be reduced from, what did you have, 8 kilometers to a little over 1 kilometer?

A Yes.

Q What was their reason for doing that?

MR. HYNES: If you know.

BY MR. POPE:

Q What was their expressed reason to you for doing that?

A That it is difficult to sample that far out without the resources available.

Q Because of the depth of the water?

A Not so much the depth of the water, but the difficulty of sampling an open body of water such as Lake Michigan when the interest is specifically on

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Waukegan Harbor.

Q Did you tell them that the change in those parameters would affect the accuracy of their findings?

A I don't recall whether I told them that exactly.

Q If you didn't tell them that exactly, you must have made some comment when you told them this. Can you give me what that was, did you tell them it would not affect the accuracy?

A I don't recall exactly what I told them. The degree to which one extends a sampling program out into the Lake depends on the estimate of dispersion and mixing processes.

If one collapses the sampling grade further out toward the Harbor, then the boundary over which one conducts the analysis is simply restricted.

My recollection, that probably is the reason why I did not have any major objection to this reduction.

Q You had not changed your view as to what would be the appropriate way of making those measurements out in the Lake, did you?

A Again, the determination of the sampling program is never done in a vacuum. One has to tailor

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the sampling program to the resources available.

This particular sampling program as it finally evolved was consistent with the resources available.

Q Any other ways that your proposals were changed or not followed?

A That looks like about it.

Q Calling your attention to Table No. 6, can you tell me what this means, "Variable Set C - Water Column"?

A That was --

Q It is in your handwriting, is it not?

A Yes. That was a summary of the basic suggestions I made with respect to sampling in the water column.

Q With regard to these various factors, is that right?

A Correct.

Q PCBs, total suspended solids, specific --

A Conductance.

Q What is that?

A Measure of electrical conductivity in the water.

Q Temperature and --

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A Meteorological variables.

Q What about chlorides? Weren't they included?

A I think chlorides were included in a separate set like Variable Set A.

Q Why is this listed as a variable set?

A A variable set refers to the water quality variables that would be collected under that particular scheme.

Q I guess my question is are these alternative proposals to the EPA, either to follow Variable Set C, Variable Set A or what?

A I think Table 6 on the open lake survey refers to the specific sets of variables indicated. That would be PCBs, total suspended solids, specific conductance. That is to distinguish it from Variable Set A, water column for the Harbor, and Variable Set B for the Harbor. Each of the different sets was suggested to be analyzed at different times.

Q Why did your recommendation contain different variables for different places?

A Well, the assumption at that point that the open lake, particular aspects of the open lake that was of importance was PCB and suspended solids and conductance. In the Harbor itself, based on the data

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that were available at this time, there were information that indicated chlorides and lead may have a potential as a calibrating level for dispersion, so in the Harbor they were included.

Q Was it your intent at that point in time to study movement of chlorides from the Harbor into the Lake?

A Yes.

Q How could you do that if you weren't going to measure chlorides in the Lake?

A This is the open Lake. This would have been the grid to stations considerably removed from the Harbor, immediate Harbor area.

If you look, as I recall, if you look at the grid of stations, it was suggested that chlorides be collected outside of the area of the Harbor, not in the open Lake.

Q Was it your opinion there would not be any measurable chlorides in the Lake?

A No, it was my opinion that there would not be any substantial change in the chlorides from the area or from Waukegan out into the open Lake.

Q How about PCBs? Was it your opinion there would be substantial change from the area outside the

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Harbor to the open Lake?

A At this stage, I didn't know if it was one of the reasons for suggesting the sample.

Q As far as you know, these sampling proposals were followed, is that right?

A With the exceptions that I discussed earlier.

Q How about the sampling proposal with respect to PCBs? Were they followed?

A To the best of my recollection, yes.

Q And your recommendation was that for PCB, there be sampling in the water column. There would be sampling at two depths, is that right; 1 meter below the surface and 1 meter above the bottom, is that right?

A Yes.

Q Does your final report use those results?

A Of this sampling program?

Q Yes.

A Yes.

Q And did in fact you use the results of PCBs 1 meter below the surface and 1 meter above the bottom?

A I don't recall.

MR. POPE: Mr. Hynes, do you want to give the witness his report so he can look it over.

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BY THE WITNESS:

A The report doesn't indicate whether the samples were top and bottom, so I frankly cannot tell from this report.

BY MR. POPE:

Q During the period of time you worked on this project, did you ever ask anybody whether the samples were taken as you suggested?

A What I am saying is that I don't recall in the data base I used here whether top and bottom samples were included.

Q What was the significance of asking for top and bottom samples of PCBs? What was that designed to show you?

A The thought was to show whether there was any significant gradient in PCBs on the bottom versus the top.

Q Change, in other words?

A Yes.

Q Do you know whether you formed any conclusions on that subject?

A No.

Q Whether or not they are incorporated here in your report, do you know whether you reached any

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conclusion on that subject as to whether there were gradients or there were none?

A I do recall forming some conclusion about the gradients in solids from top to bottom which leads me to recall that there were some samples taken from top to bottom, yes.

Q Are we to assume that the references to PCB in the water column in your final report are an average of the figures top to bottom?

A By station, yes.

Q Is that in your opinion the proper way to go about reporting those types of numbers?

A Yes.

Q If there was a gradient in the difference, do you know which way the change was? Was there less at the bottom or less at the top?

A I think the difference was relatively slight and I would, again, have to check the details of each of these sampling stations and each of the analyses to determine whether there was any significant difference, consistent difference from top to bottom.

Q Does that data, namely, the difference between parts per million of PCBs at the top of the water or 1 meter below the surface as opposed to the parts per

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million 1 meter above the bottom, is that a significant factor in analyzing whether or not there is transport of PCBs?

A Yes, it would be if the gradient were significant. The concern would be that there may be a transport of PCBs out to the Lake from the bottom.

Q If that gradient existed, we would expect to find it in your report, would we not?

A The PCB gradient?

Q Yes.

A Yes.

Q Does its absence indicate to you there was no gradient between the numbers for the top of the water column and those for the bottom?

A I think the report does show some values for certain of the samples, the range of values from top to bottom, and as I indicated, it is not that great.

Q Show me where that is, would you?

A In the first place, this is with respect to chlorides on Figure 30. Then a series of figures that begin on Figure 19.

Q You are talking about differences in PCB, are you not?

A First on chlorides and then suspended solids

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and then on PCBs beginning at Figure 22.

Q This data flowed from your sampling program referred to in Table 6 whereby two samples of PCBs were taken 1 meter below the surface and 1 meter above the bottom, is that right?

MR. HYNES: The use of the word flow, I think, is somewhat vague.

MR. POPE: Where did the data come from?

MR. HYNES: You mean the idea for the data?

MR. POPE: Yes.

BY MR. POPE:

Q Is that correct?

A Yes, that is correct.

Q That data appears on Figure 22 and also 23?

A Yes, and 24.

Q Did you form any conclusions on the basis of your review of the data with respect to the gradient in the water column of PCBs as to transport?

MR. HYNES: Do you understand the question?

THE WITNESS: Yes.

BY THE WITNESS:

A I concluded that the gradient was not sufficient to warrant a vertically stratified transport calculation.

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BY MR. POPE:

Q Was that data that provided you with the ability to make that conclusion supplied by Argonne?

A Yes, some of it was.

Q I don't know where to go with some of it. Can you identify what was supplied by Argonne?

A I think the chloride data was supplied by Argonne. Solids data and the PCB data was supplied by Cranbrook Institute.

Q How about in the open Lake? Was there any data collected in accordance with your proposal on Table 6 of Exhibit 2 for the collection of PCB data a meter below the surface and a meter above the bottom in the open Lake?

A I'm sorry, was there any suggestion made to do that?

Q That was Table 6, is that right?

A Yes.

Q Distinguishing from chloride, talking about Table 6, was that data collected?

A Yes.

Q Was that done by Argonne, Table 6, on the open Lake?

A To my recollection, they did collect some data

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right off the mouth of the Harbor, but other data were collected by Cranbrook.

Q Who collected the open Lake data, to the best of your recollection?

A Well, open Lake, as you recall, was out to 8 kilometers and that was not part of the sampling survey.

Q That was not done at all?

A No.

Q But with regard to the 1 kilometer?

A Cranbrook did that.

Q Did that data reflect a gradient difference between PCBs at the top of the water and PCBs at the bottom?

A No, not significantly.

Q Is that data reported here?

A Yes.

Q That is Figure 22?

A That is not reported for PCB, but it is for suspended solids.

Q Is this data for the gradient PCB figures reported anywhere?

A I think -- I stand corrected. I think Figure 22, I again have to check the details, but Figure 22,

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all of the stations that are marked with the L are the Lake stations.

Q Is that right?

A Yes, that is correct.

Q That is on 22 and 23?

A 22 and -- 22 has one L station.

MR. FEATHERSTONE: How do you explain the L station in Figure 23 that is to the left of 0 meter distance from the mouth of the Harbor which I assume means it is in the Harbor?

THE WITNESS: No, sir. That station is to the north of the Harbor and simply plotted on there to show that is the concentration north of the Harbor into the Lake.

MR. FEATHERSTONE: How far into the Lake, can you tell?

THE WITNESS: It would be approximately, maybe 50 meters. The Harbor juts into the Lake at that point.

BY MR. POPE:

Q On Figure 23 are we talking about 4L here as being one of those sampling stations out in the Lake that was measuring PCBs both at the bottom and at the top?

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A We are talking 4L, but I don't see any specific reference in this figure for range top to bottom. I would have to check whether that range was so small it wasn't plotted.

Q How would you check that?

A I would have to go back to the individual day sheets.

Q Is that the same for Figure 22?

A That is correct.

Q In fact, there is no place in that report you can determine that at all, is there, whether there was a gradient in the Lake on the PCB measurements?

A That is correct.

Q Did you review any reports from Argonne other than data?

A Yes.

Q What was that?

A The results of the sampling in the Harbor.

Q That was in preparation of your final report?

A Yes, that is correct.

MR. POPE: I suggest we take a break for lunch, but I just want to diverge into one other thing before, if that is acceptable to you.

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THE WITNESS: Yes.

BY MR. POPE:

Q Would you tell us what you have done to prepare yourself for this deposition, Dr. Thomann?

A I met one day here with attorneys.

Q Attorneys for the United States Government?

A Yes, and I spent this preceding Tuesday in a review of the material that I had.

Q Where was that done?

A At HydroQual and at home.

Q Did you review on Tuesday materials more than these you brought with you today?

A Not that I recall.

Q Can you tell me what it was you did review, whether it was with the attorneys or whether it was on your own last Tuesday?

A I reviewed that report.

Q Namely, your final report?

A Yes, some of the notes that I had submitted to the attorneys here for submission to you and some of those reports.

Q Some of the reports, which reports?

A Specifically I don't recall exactly which ones. I might have leafed through a majority of them

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to just familiarize myself again with the material.

Q You are referring now to the data collection by Encotec and Armstrong and Battelle?

A That is correct.

Q Can you tell me how many of these reports you did review for purposes of the deposition and which ones were they so we have no misunderstanding on that.

A I don't recall exactly how many.

Q I just want to know what report it was that you did review for purposes of the deposition, whether it was here in Chicago or in New York.

A Battelle, Encotec.

Q One Encotec, is that right, the same one as we have been discussing before?

A Yes, the same one we have been talking about before; my own notes.

Q Which you have provided to the attorney and they provided to us?

A Yes.

The paper that I talked about in here that I have the manuscript referenced in here to check on the theoretical structure model.

Q Can you identify that paper with a little better precision?

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A It is called the Thomann 1980 B.

Q Referred to here in the references at the end of the report as No. 15, is that right?

A Yes.

Q Is that within the documents produced?

A Yes.

MR. HYNES: Yes.

BY MR. POPE:

Q Anything else?

A I also checked with the Strachan report which is referenced at No. 13, Page 109 on polychlorinated biphenyl and Great Lakes precipitation.

Q What was the purpose of checking into that one?

A I wanted to make sure I understood what they did from an analytical point of view.

Q Is there anything else you did by way of preparation?

A I believe I also examined the Newengraph report, No. 11.

Q For what purpose?

A Just to familiarize myself again with the calculation that we made and the factual background of that calculation.

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Q Is that it?

A That is it for the North Ditch sediment movement.

Q Is that from Argonne or U.S. --

A That is U.S.G.F.

Q Anything else?

A I also refamiliarized myself with the question of evaporation.

Q In what fashion?

A To check my notes again and what I had done in estimating evaporation and to convince myself that evaporation was not significant.

Q Anything else?

A I would have to look at the list of the other reports I had submitted to the attorneys here to see which of those I looked at. I don't have it.

Q Above and beyond whatever it was you submitted to the attorneys and they resubmitted to us, was there anything else you reviewed by way of preparation?

A That's about it, as I can recall.

Q Other than some of the attorneys working for the United States Government on this case, did you talk to anybody else about this case or about the report or

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in preparation for your deposition?

A Yes, I talked to people at HydroQual about it.

Q Who was that?

A That would have been Michael Kontaxis, the man I worked with on this project.

Q The co-author?

A Yes.

Q Anybody else?

A Other than casual reference with some of the principals of the firm that I was coming out here to provide deposition.

Q Did you review any of the transcript that has taken place in this case in depositions or any abstracts of depositions?

A No.

Q Were you provided with any summaries of what the depositions have been to this date?

A No.

I should indicate, in my discussions with Mike Kontaxis I also reviewed with him some of the computer output.

Q Did you find any errors or anything that would need to be brought to the attention of anybody concerning this report?

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A No.

Q Have you talked to anyone that has given testimony in this case, to your knowledge?

A No.

Q What would you estimate is the total amount of time you spent preparing for this deposition?

A Specifically for this day?

Q No, I cannot limit it to that. I don't know, you may have been given one other day one other time, but in general to give your testimony following the submission of your report, how much time have you spent?

A Following the submission of this report, I would guess no more than a total of about 5 to 10 days.

MR. POPE: Why don't we break for lunch.

(At 1:15 o'clock p.m., a lunch recess was taken to 2:15 o'clock p.m., this same day.)

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF ILLINOIS
EASTERN DIVISION

THE UNITED STATES OF AMERICA,)
)
 Plaintiff,)
)
 vs.) No. 78 C 1004
)
OUTBOARD MARINE CORPORATION)
AND MONSANTO COMPANY,)
)
 Defendants.)

September 17, 1981,

2:15 o'clock p.m.

The deposition of ROBERT V. THOMANN
resumed pursuant to a luncheon recess at 219 South
Dearborn Street, Room 1400 Conference Room, Chicago,
Illinois 60604, before Thea L. Urban.

PRESENT:

MR. JAMES T. HYNES,
MR. MICHAEL A. POPE,
MR. JEFFREY C. FORT,
MR. BRUCE A. FEATHERSTONE.

- - -

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ROBERT V. THOMANN,

called as a witness herein, having been previously duly sworn, was examined and testified further as follows:

DIRECT EXAMINATION (Resumed)

BY MR. POPE:

Q Dr. Thomann, I show you a copy of a 6-page document which has been produced by the United States Attorney's Office to us. I would like you to look that over and tell me if that is in fact some notes that you used in preparing your initial March 1979 recommendations to Dr. Veith.

A Yes.

MR. POPE: Miss Reporter, would you please mark that document as Exhibit No. 3.

(Thomann-OMC Deposition

Exhibit No. 3 marked for

identification, 9/17/81, TLU.)

BY MR. POPE:

Q Does the first page of the exhibit reflect numbers that you used which appear in Table 1 of Thomann Exhibit 2 for identification?

A Yes, it is the beginning of that table right there.

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Q I take it these numbers 0.2 are the same figures that you used here under the Harbor water column in Waukegan Harbor, is that right?

A No. The .2 is the concentration in Waukegan Harbor, micrograms per liter, and the 200 grams which is .2 kilograms is that number there. (Indicating to Exhibit 2.)

Q What is this calculation down here at the lower part of the first page?

A That is the calculation that reflects the estimate of the mass of sediment, the mass of PCB in the sediment.

Q Nos. 1 and 2?

A That is part of the calculation and they continue onto the next page.

MR. FEATHERSTONE: You are referring to Exhibit 3?
BY THE WITNESS:

A (Continuing.) Exhibit 3, and they carry onto the next page of Exhibit 3, so that number is rounded off.

BY MR. POPE:

Q 26,112 kilograms, you rounded off to 26,000?

A Yes.

Q Would it be fair to say that your calculations

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both for the Harbor and the North Ditch came from the Battelle report?

A Yes, that is correct.

Q And also you got your figures as to the dredging by the Corps of Engineers, is that right?

A That is correct.

Q Up to that point are you supplying Dr. Veith with anything he didn't already have?

MR. HYNES: To the best of your knowledge.

BY THE WITNESS:

A Yes, to the best of my knowledge.

BY MR. POPE:

Q You are?

A Would you ask the question again, am I supplying him?

Q Up to this point in the calculations, are you supplying him with anything other than what he has supplied you?

A You mean in the sense of just playing back what was in the Battelle report?

Q Right.

A Well, I think it is a different perspective on the question, recalculation, the evaluation of that report.

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Q In what sense is it a different perspective?

A I raised certain questions about the mass, where is the dredged spoil, dredge in question, how much is in the water Harbor column and so on.

Q You raised different questions that were not raised by the Battelle report?

A As I recall, yes.

Q Then on Page 2 of this Exhibit 3, what is this calculation determining, the bottom half of the page?

A I think I was estimating here the rough order of magnitude just by a single calculation. If the volume of the Harbor sediment were considered to be 300,000 cubic meters on 100 micrograms on the sediment, I was attempting to estimate what the order of magnitude might be.

Q The order of magnitude of what?

A The amount of PCB on the sediment.

Q Down to what level?

A I think the 300,000 cubic meters is the volume of Harbor sediments down to 5 feet.

Q Is this designed to check on your earlier calculations to see if you are in the same area?

A To see if it is in the same boat.

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Q Up to that point in time in the calculations that led to Table No. 1, would it be fair to say that if you were to assume that there were additional PCBs below 5 feet into the sediment, you were not taking those into account at all, is that right?

A Not directly. The only attempt of this calculation was to see for an order of magnitude of several hundred thousand cubic meters of sediment what is the approximate order of magnitude of sediment PCB, so that might have been missed below 5 feet and some of it might have been missed above 5 feet.

Q Had you ever, prior to this point in time in March '79, done this study to determine the approximate amounts of PCBs below 5 feet into the sediment, either here or any other place in the country?

A No.

Q Did you have any reason to believe there were not substantial amounts of PCB below 5 feet into the sediment in the Harbor and into the environment?

A No.

Q Were you making an assumption in doing Table No. 1 that PCB-bearing fluids had been used in the vicinity for 20 years or so?

A I don't think that was a key assumption in

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the construction of Table 1, although it probably entered the computation of the dredging mass over a period of time.

Q It also entered the calculation of the total discharge rate according to the chart?

A No, the calculation of the total mass, you mean? You said the total discharge. You mean --

Q No, I mean right here where it says "total discharged 380,000 kilograms."

A Yes, at that point definitely, but up in here, no.

Q In the preparation -- let us back up in the preparation of Table No. 1.

You were assuming that there had been some kind of discharges for a period of 20 years or so, is that right?

A Yes, that was an assumption.

Q Wouldn't it be true that in a situation such as that where you had a discharge over a long period of time that substantial amounts of PCB would be below 5 feet into the sediment?

A I don't think one can say that at that point.

Q Did you give it consideration, in your mind?

A I don't recall that particular question being

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given consideration.

Q Why wasn't there sufficient information to answer that question one way or the other?

A I worked with the information that was at hand. Why there wasn't any other information, I have no knowledge.

Q But you did not consider that, I understood you to say, because you had no way to know whether that was true or not, whether there was any PCB below 5 feet, is that right?

A It was a question I did not consider in detail.

Q You didn't consider it at all?

A Yes.

Q Correct.

Page 3 of your back-up document makes reference to Professor Murphy's article, is that right?

A Yes.

Q Right after 10 percent loss you have a question mark, is that right?

A Yes.

Q Does that indicate you were skeptical about that figure?

A Yes. It indicates some concern about it.

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Q Did you do anything to check on the veracity of that figure before you prepared Table 1?

A At that point, no.

Q The question mark did not appear in your final Table 1, did it, with respect to whether that 10 percent of purchase was a correct calculation?

A That is correct.

Q Then I understand the rest of Page 3 is a continuation based on that assumption that 380,000 kilograms was in fact the proper figure to use for the amount discharged, is that right?

A That is correct.

Q Why did you then in the next line go on to factor in the 314,000 kilograms over a 20-year period? What was the purpose of that calculation?

A Just to get some estimate of the total amount of mass that I could not account for at this particular stage, given everything else I had on hand regarding the sediment and the water column PCB.

Q Was one of the areas that you could not account for at this point in time the amount of PCBs located in the sediment below 5 feet?

A No.

Q Pardon me?

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A No, that was not one of the areas.

Q That was not one of the areas that you could not account for? You were able to account for that?

A I was able to account for everything 0 to 5 feet. Everything below 5 feet is not incorporated in this analysis.

Q One of the areas that you were not able to account for in this calculation was how much PCB was below 5 feet deep in the sediment, is that right?

A That is correct.

Q Is that one of the things that you suggested to Dr. Veith ought to be examined to determine the total estimated amount of PCB mass?

A I don't recall.

Q I will hand you your Exhibit No. 2 and ask you if reviewing that refreshes your recollection that that was one of the areas you suggested be studied in order to make an accurate estimate of the total amount of PCBs in the sediment?

A I do not see any reference to that effect in this document.

Q Does that document refresh your recollection that you orally told Dr. Veith that in order to do an accurate estimate of the amount of PCBs in the sediment,

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you would have to measure how much PCBs were below 5 feet into the sediment?

A I don't recall.

Q As a matter of fact, you never suggested to Dr. Veith that that should be done in order to make your estimate more accurate, isn't that true?

A I don't recall that.

Q The bottom of Page 3, you refer to the same language that appears in the report regarding key assumptions and then if I understand this correctly, it says:

"If relax assumption No. 2," and referring to the amount, "and assume 100 micrograms over all sediment dredged and for entire volume now in place (see Page 2A) have 118,000 kilograms accounted for or 262,000 kilograms unaccounted for," is that correct?

A Yes.

Q And then you divide it again by number of years.

What does it mean "if relax assumption No. 2"?

A Assumption No. 2 talks about estimating the amount of PCB removed by dredging by the Corps of

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Engineers. The first assumption there was 50 micrograms per gram, was the concentration of PCB in the sediment. If that is changed to 100 micrograms per gram in the sediment, this calculation results.

Q And you refer to that as relaxing that assumption No. 2, is that right?

A Yes.

Q It produced a lesser number of kilograms of PCB unaccounted for, is that right?

A Yes.

Q In the preparation of your March 1979 report, was it your intention to show a large amount of PCB that was unaccounted for?

MR. HYNES: Excuse me. Would you read that question?

(Question read.)

BY THE WITNESS:

A No, I don't think that was my intention.

BY MR. POPE:

Q Was it your feeling that the larger the amount shown in Table No. 1 that was unaccounted for, the more likely Dr. Veith was going to need to hire you to do a model?

A No, I don't think that is the case at all.

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Q Can you tell me what this calculation here is on Page 4 of Exhibit No. 3?

It says A Simple Model.

A That is a calculation or a set of equations representing our thinking on mass balance for a system like Waukegan Harbor, Illinois.

Q When you say mass balance, what are you referring to?

A In trying to account for the various mechanisms that move the mass of a particular substance into or out of a system like Waukegan Harbor.

Q Is it possible to do such a study without knowing how much mass is in the Harbor to start with?

A Would you just describe to me what you mean by such a study?

Q The type of model, study, mass balance studies you have just described.

A It depends on the objectives of the study. For some investigations, you need to have information on the mass in the Harbor. For other types of studies, you would want to predict that.

Q For types of studies showing movement of mass, you would not need to know how much there was to start with, is that your testimony?

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A If you need to study the movement of water in and out of a system such as Waukegan Harbor, you would need to have some information on the concentrations in the Harbor.

Q What do you mean, some information?

A Information sufficient to describe changes in gradients in the substance from one end of the Harbor out into the Lake.

Q Is it your testimony that for this particular study you did in this case, for purposes of testimony, it is not necessary for you to have accurate figures as to the amount of PCBs that were in the Harbor?

MR. HYNES: Objection, I think you are mischaracterizing what the witness said.

MR. POPE: That is a leading question, Jim.

BY THE WITNESS:

A I was specifically referring to estimating the transport in and out of Waukegan Harbor. As I indicated for that, you do need some information on some substance that reflects that transport pattern.

BY MR. POPE:

Q By some information, you mean accurate information, don't you?

A Enough to describe the distribution of that

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substance from the inner Harbor out to the Lake.

Q How much is in versus how much moves out, is that right?

A What the gradient, what the profile of the substance is from the Harbor to the Lake.

Q Are there other parts of the study that you did in this case for which you don't need to have accurate information about how much PCB was in the Harbor to start with?

A Two things: I haven't said anything about PCBs. And I only talk about a substance describing the transport in and out of the Harbor.

Secondly, I don't know what you mean by accurate, so I have to have some clarification on that.

Q You don't know what I mean by accurate?

A Yes.

Q What do you mean? How come you don't understand what the word accurate means?

Is there a term of art you are referring to that I am not aware?

A You might be referring to accurate in the sense of the measurement being an accurate representation of the substance in the sample.

I am talking about a sufficient number

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of samples to indicate distribution of the transport from the Harbor to the Lake.

Q I will adopt your second definition of accurate.

The question now is in the various parts of the study you did in this case, a copy of which you have here, were any of those parts of the study not necessary for you to have accurate information as to the amount of PCBs in the Harbor and Ditch to start with?

A No. You would need accurate information.

Q For all parts of your study, is that right?

A That is correct.

Q Can you tell me what appears on this, what must be the fifth page, the second to the last page of your Exhibit No. 3 which is your notes. What are those calculations doing?

A These are calculations intended to estimate the possible flux out of the Harbor, assuming horizontal exchange was given.

Q Would you tell me what you mean by horizontal exchange?

A The degree to which there is mixing between the Harbor and the Lake.

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Q What were you using for your information in doing these calculations?

A On the basis of my own experience on mixing between systems and estuarine areas for which the Harbor and Lake systems are quite or could have been quite similar.

Q That is estuaries, you are talking about?

A Estuaries, yes.

Q Is your testimony that your experience in estuaries is a good analogy for working in harbors and lakes, is that correct?

A That is correct.

Q You were measuring here some potential flux, is that right?

A I wasn't measuring anything. I was --

Q I am sorry, calculating.

I take it you are calculating possibilities, is that correct?

A Right.

Q Possibilities of movement or of flux?

A Possibilities of flux.

Q What does that mean?

A That means how much mass might be exchanging between the Harbor and the Lake.

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Q This page of calculations was based on your past experience as opposed to taking numbers out of the Battelle report, Encotec report and examining them, is that correct?

A That is correct.

Q What did you come up on the basis of your calculations there?

A That the flux might be anywhere from 69 to 690 kilograms per year.

Q Does that indicate transport in and of itself?

A I'm sorry, I don't understand.

Q Does that indicate transport of a particular substance in and of itself per year, a certain amount per year?

A Yes. In this case it was an attempt at estimating the flux of PCBs from the Harbor to the Lake.

Q What do you use by way of input to those calculations besides your own experience? Do you use something to do with the measurements of the Harbor or the flow of water or what?

A Yes. You need the concentration of PCB in the Harbor and in the Lake; as I mentioned, an estimate of the mixing between the Harbor and the Lake and the

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cross sectional area over which that mixing occurs.

Q Which would be the place where the Harbor and the Lake come together, is that right, how big an area that is?

A Yes.

Q And did you do those calculations and you concluded that the amount might be 69 kilograms per year or it might be 690 kilograms per year, is that correct?

A Yes, that's right.

Q Does this final page fit into that calculation?

A I don't know what that final page is.

Q Would it be fair to say that your initial work on this project led you to believe there was some transport of PCBs from the Harbor into the Lake regardless of whether it was one number or a number 10 times that?

A Yes. I think at this point on the basis of that calculation, I did think there was some transport.

Q Did you communicate that information to Dr. Veith or anyone else at U.S. EPA?

A I most probably did.

Q Was that orally or was that in writing?

A Most probably orally.

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Q I take it it was Dr. Veith you communicated that information to?

A Again, I don't recall exactly.

Q Did you tell Dr. Veith or whoever it was that your initial calculations varied by as much as an order of magnitude?

A I don't recall whether I was that specific.

Q That is a correct way to describe the difference between 69 and 690, is that correct?

A That is correct.

Q Am I correct in assuming that the preparation of Exhibit No. 1 was the next contact you had with this project?

A That is correct.

Q Why don't you just look at Thomann Exhibit No. 1 for identification and tell me what it is.

A This is the contract between Hydrosience and EPA to study the PCB contaminated Harbor sediment.

Q You were a principal reason why Hydrosience got that contract, I take it?

A That is correct.

Q Did you have some kind of commitment, formal or informal, with Hydrosience as to how much of that work would be done by you?

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A Yes, I recall and I think as I stated in here, I had estimated 120 hours.

Q How many other people were going to work on that project besides yourself?

A As indicated he has several others: John St. John, Higgins, Kontaxis and so on.

Q Shown on Table 2 of that document?

A Yes, shown on Table 2.

Q Is this your handwriting here on Table 1?

A Yes, it is.

Q Is that a breakdown of functions that you were going to perform as opposed to other people in the firm?

A This has reference to preparation of the final report, appears to be an assignment to me to write those sections.

Q Being conclusions, recommendations, bio-accumulation, significance of Harbor discharge to Lake Michigan, is that correct?

A That is correct.

Q Who was to do the rest of these, do you remember?

A My recollection was John Higgins was assigned the rest of that.

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Q One of the ones you were not assigned was transport of PCB from the Harbor to Lake Michigan, is that correct?

A By assigned, I think --

Q Right, this is the first draft.

A The first draft, that is correct.

Q Was that not what the basic original assignment was to your office, to study transport of PCB from the Harbor to Lake Michigan?

A That was one of the aspects, yes.

Q Was that one of the aspects that you personally specialized in?

A That is one of the aspects that I specialized in.

Q Was this Exhibit No. 1 submitted to the EPA as is, or had there been an earlier draft submitted and changes made in the text?

A I don't recall exactly, but most probably there were earlier drafts.

Q Which would then be submitted to the Agency and there would be some discussion amongst the parties as to what was being done, to be done?

A That is correct.

Q One of the provisions in this proposed

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contract is that Hydrosience will gather and review International Joint Commission, EPA and University of Wisconsin-Madison data, as well as other available information, on the loadings to Lake Michigan from municipal, industrial, tributary and atmospheric sources.

I take it that is the loading of PCBs, is that right?

A That's right.

Q Was that done?

A Yes.

Q Is it your testimony that there were no other sources of PCB, no other industrial sources of PCB into Lake Michigan other than Waukegan Harbor?

A I think I recollect saying this morning that there was some evaluation of industrial inputs, although it was small, but I don't recall in detail what that level of industrial input is.

Q You are talking now to the present state of your knowledge?

A That is correct.

Q Was the work performed in accordance with the basic task plan in the document?

A Yes.

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Q Was the estimate of expenses roughly correct, \$44,946?

A Yes.

Q At the time this contract was entered into with Hydrosience, was hydrosience a subsidiary of Dow Chemical Company?

A Yes.

Q Was this task plan part of an overall contract?

MR. HYNES: You mean an overall contract with Hydrosience?

MR. POPE: Or anybody else I can think of.

BY THE WITNESS:

A As best as I can recall, this contract was under a task order that I believe either Dow or a subsidiary of Dow had with EPA.

BY MR. POPE:

Q That would be Contract No. 68-03-2568?

A Right.

Q Whereas, this would simply be a portion of the Directive T-7010, is that your recollection?

A I don't know that for sure.

Q Is that your best recollection right now?

A Yes.

Q Were you to oversee the work, the entire

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amount of work under this undertaking?

A I had a principal responsibility in it, yes.

Q When was the date this document was prepared?

A I don't recall, I'm sorry. I don't recall.

Q When did you begin doing the work under that project?

A Probably a few months after that report that we talked about earlier.

Q March of 1979?

A Right.

Q From the time of your initial discussions with Dr. Veith to the preparation of Exhibit No. 1 for identification, the scope of the project seems to have grown, is that correct?

A That is correct.

Q At whose instance did that scope grow?

A The best of my recollection, that was a request from EPA to evaluate the various aspects indicated in this task plan.

Q Did the EPA put you under any restrictions with respect to evaluating these various questions?

MR. HYNES: Objection, I think that is vague. What do you mean by restrictions, in what regard?

MR. POPE: In any regard.

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BY THE WITNESS:

A Well, certainly there was a budgetary restriction.

BY MR. POPE:

Q Say for the \$45,000 or so we have allocated here, is that right?

A Yes.

Q Anything else?

A Time restriction. We didn't have an infinite amount of time to complete the work.

Q That is the last page of the exhibit which shows suggested or planned projected time schedule, is that right?

A Yes.

Q Any others?

A Not to the best of my recollection.

Q In your estimate of the total amount of PCBs in the sediment, were you put under any specific restrictions by EPA in terms of things you could not consider?

A Not that I recall.

Q Did you seek any information in connection with that particular part of the work which was not provided to you?

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A I'm afraid I don't understand you.

Q In connection with your estimation of total amount of PCBs in the sediment, did you request any information from EPA or from the attorneys that was not provided to you?

A Not that I recall.

Q Did you in connection with that estimate?

A Which estimate?

Q Let us back up.

My understanding is one of the aspects of your project was to estimate how many PCBs were in the sediment, is that right?

A That's right.

Q That is the estimate I am talking about.

In connection with your work on computing or calculating or making your estimate of PCBs in the sediment, did you seek any information from EPA with respect to the operation of Johnson Motors?

A The best of my recollection in the estimation of mass of PCB in the sediment, I did not seek that kind of information for that purpose.

Q Did you seek any information with respect to Monsanto or its products in connection with that estimation?

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A To the best of my recollection, no.

Q With respect to that estimation of the amount of PCBs in the sediment, did you seek any information from U.S. EPA as to the total amount of sampling that had been done at the site?

A Yes.

Q Were you provided at any time with any samples that went below, substantially below 5 feet into the sediment?

A I don't know.

MR. HYNES: Objection to substantially below.

MR. POPE: I don't want to get hung up on 5 or 6 feet. This is the one he did look at already. I don't want to reiterate. I understand he does not recall how long some of them went.

MR. HYNES: My objection is only to substantially below. To me and you it might be different from what he might consider substantially below.

MR. POPE: I will rephrase the question.

BY MR. POPE:

Q In connection with that estimate, did you ask EPA for any core sampling data that went below 5 feet into the sediment?

A My request to EPA was to submit any information

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they obtained on the cores. I don't recollect, as I indicated earlier, to what degree those cores extended beyond 5 feet.

Q Do you have your work papers here? Could you examine those to determine whether there was such information that was provided to you?

A I would have a need to examine the Mason and Hanger report and some of the other reports that I mentioned.

Q You are not familiar with those as you sit here now?

A Not on that question.

Q Do you have those here?

A No.

Q Did you have any documents that originated from either Johnson Motors or Monsanto as part of your preparation of this report?

A Yes, I did.

Q What did you have?

A I had a series of documents that extended back perhaps to the early 1970s which were provided to me by EPA that delineated various aspects of the situation in Waukegan Harbor.

Q Such as what?

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A As I mentioned earlier, such as concentration of PCBs in some of the outfalls, the purchase of PCBs, how much was purchased, and information of that type.

Q Where are those documents now?

A I think -- where are they now?

Q Yes. You relied on it to prepare your report, is that right?

A Yes.

Q Are they here in the room?

MR. HYNES: Those are part of the documents I believe we turned over to you.

MR. FEATHERSTONE: Are we talking about the final report now?

THE WITNESS: No.

MR. FEATHERSTONE: What report are we talking about?

MR. POPE: Off the record.

(Discussion off the record.)

MR. FEATHERSTONE: What report are we talking about now?

MR. POPE: The final report.

BY MR. POPE:

Q My question was what documents you were provided with that you reviewed as part of preparing the

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final report in this case.

A Yes, and that is what I was responding to.

Q And we have an agreement that overnight or in the morning, counsel will look for those materials that are from U.S. EPA and Outboard Marine that were provided to you and we will look at those in the morning if you can find them.

MR. HYNES: And we are talking about --

MR. POPE: With respect to estimated --

MR. HYNES: Estimated purchases, I think.

MR. POPE: Well, that is what he may be talking about. I am talking about estimates of the amount of PCBs in the sediment. That is the same thing, I think.

MR. HYNES: Well --

MR. POPE: Let me clarify.

MR. HYNES: Yes.

BY MR. POPE:

Q Dr. Thomann, I was just asking you about the documents that you had, that you requested or didn't request, I don't know which, from U.S. EPA that played a role in the work you did to estimate the amount of PCBs in the sediment.

You indicated there were some documents provided by the U.S. EPA.

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A Yes.

Q I understand those are about 20 to 25 documents, something like that, in this area; is that right?

A Well, let us clarify that. We had started to get into a discussion of fact that certain documents were used in the estimation of mass of PCB in the sediment.

Q Right.

A The kind of documents you are talking about now, the OMC documents, the purchase documents and so on, the best of my recollection, were not used specifically to estimate the mass of PCB in the sediment.

Q What was used by way of additional material other than the sampling data?

A Other than the sampling data that EPA provided to me, that was the primary input to estimating this.

Q I understand and Mr. Hynes will try and give us this material the next morning.

Did you have any documents that originated with Monsanto?

A I think there are several memos that I have, yes.

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Q Do they play any role in your estimate of the total amount of PCBs in the sediment?

A To the best of my recollection, no.

MR. POPE: Will you include those materials to be provided in the morning?

MR. HYNES: Yes.

MR. POPE: Thank you.

MR. HYNES: Wait. There is one thing I am not clear on. Maybe I am missing something here.

Sampling data to estimate the mass of PCBs, Dr. Thomann I believe stated that there were sampling documents provided.

MR. POPE: He didn't want to be pinned down to the notion that he relied on the Johnson estimate in order to come up with his estimate, okay?

I understand that. My request still is to produce those documents.

MR. HYNES: The Johnson documents?

MR. POPE: And the Monsanto.

MR. HYNES: That he relied on, and something in the report?

MR. POPE: Absolutely, and the only ones that went into this were the sampling documents.

MR. HYNES: We have three categories: The sampling

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documents you have. The Monsanto documents, we will look for them that he had, the ones he had reviewed, and the OMC documents that he reviewed.

MR. POPE: Thank you, sir.

MR. HYNES: Okay.

BY MR. POPE:

Q And to summarize what we have not accomplished, you were never turned down on any requests you made for information in this case, is that right, from EPA?

A To the best of my recollection, that is true.

Q Is it also true that to the best of your recollection no one associated with you in this project ever suggested or raised the question as to whether it was necessary to study presence of PCBs below 5 feet in the sediment, is that right?

A To the best of my recollection, yes.

Q What was the first work that was undertaken under this project following the execution of the contract?

A The first work that was begun was the construction of a mathematical model of the Harbor-Lake complex.

Q What characteristics was that model to include?

A The model was to include flow through the

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Harbor, mixing processes in the Harbor and externally with the Lake; was to include basic mechanisms associated with the transport of a substance such as PCBs, which include the adsorption of PCBs onto particulate matter and desorption of PCBs onto particulate matter; settling of particulate matter in the sediment and the resuspension of material.

Q How many of those factors were known before you began?

A If you mean by known specifically with respect to Waukegan Harbor, very few of them.

If you mean by known did I have some perspective on what the order of magnitude of the various parameters and mechanisms that I mentioned, to that degree I did have some perspective on what some of those numbers might be.

MR. POPE: I think we should go back, Miss Reporter, and have you give me, if you would, the answer on the characteristics of the model.

(Record read.)

BY MR. POPE:

Q With respect to your answer with regard to adsorption of PCBs onto particulate matter and desorption of PCBs onto particulate matter, are there certain

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characteristics of PCBs that have general application not only to Waukegan Harbor but various other places in the country?

A Yes. They generally, usually tend to be highly adsorbed onto particles.

Q And that stems from the chemical makeup of the material?

A That is correct.

Q Would that be in the category of what was known prior to your doing the study?

A That is correct.

Q And in summary, they tend to adsorb?

A Adsorb.

Q Which means stick onto?

A Stick onto.

Q Is this one of the factors we discussed this morning where there are differences in the characteristics of adsorption power of PCBs depending on the Aroclor makeup?

A Yes, that would be one.

Q Would it be fair to say that the higher chlorinated Aroclors tend to have a greater tendency to adsorb onto particulate matter than the lower chlorinated Aroclors?

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A The literature appears to indicate that.

Q Do you have reason to disagree?

A The difficulty is that there is a considerable amount of variation in the kinds of particulates so that in some instances certain Aroclors may stick better than in other instances.

Q In your study you focused on different size particulate matter, is that right?

A We did some work with different sized particulates, yes.

Q Was that work done instead of focusing on the adsorption to different types of materials such as sand or clay?

A Yes, the attempt to look at different sized classes of particulates was to determine whether the PCBs in Waukegan Harbor were essentially associated with any particular sized cores.

Q My question was that was done in lieu of a study of adsorption tendencies of PCBs as to any type of particulate matter as opposed to size, is that correct?

A You mean a laboratory study?

I don't understand.

Q The factor that makes a difference in PCB

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tendency to adsorb to particulate matter is, all things being equal, the organic makeup of the matter, is that right?

A That is an important factor, yes.

Q You did not attempt to study that aspect of adsorption in the Waukegan Harbor, but rather studied the adsorption characteristics by size of a particulate matter, is that true?

A That is correct.

Q Why?

A I don't recall exactly the reason why. I don't know whether the question of the detailed organic particulates ever really came up. The focus on the size classes was more specifically aimed, as I mentioned, at determining whether there was a preferential adsorption onto the smaller particles.

Q As opposed to the larger particles?

A Yes.

Q Did that have some kind of significance to you in terms of Waukegan Harbor as such, the size of the particulates?

A Yes. The question in my mind was if there was a preferential adherence of PCB to smaller particles which may be more easily suspended and more easily

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settled that transport mechanism might be important as opposed to the larger particles.

Q But there was no site specific characteristic of Waukegan Harbor that you were aware of that made such a study more important there than it would be anywhere you happened to be, is that right?

A Well, site specific nature would have been the concern that a flux of material from the Harbor to the Lake might be associated with the fine particles more than the coarse particles.

Q That would be the case no matter where you happened to be studying transport, correct?

A That's correct.

Q That is what I meant by site specific.

How about in your study of the Hudson River? Had you done a similar study with respect to size of particulate matter?

A We did not, no.

Q Was it done by someone else that you are aware of?

A Yes, New York State Department of Environmental Conservation did do some size fractionage.

Q As you recall that work, the conclusion of that work, what was the conclusion with respect to

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tendency to adsorb to smaller particulate?

A In the Hudson case it was a little different. To that degree it is a site specific question.

The Hudson case was a much more large, woody-type debris which the PCBs adhered as opposed to the absence of that material in the Waukegan area.

Q Were you advised that there was such absence in Waukegan Harbor at the time you were preparing this model?

A I don't think that question ever came up.

Q What investigation did you do as to what the nature of the Harbor was from that point of view?

A Simply from the point of view that the Harbor, Waukegan Harbor is a vastly different water body than the Hudson River draining 8,000 square miles.

Q Is it true, at least it was assumed at that time that generally PCBs will tend to adsorb to smaller particulates? Is that right?

A That was an assumption.

Q Was that borne out by your study?

A Our evaluation of data that was provided to us indicated that there did not appear to be such a preferential adsorption.

Q How about the question of settling and

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resuspension? Had there been studies done in the past showing the basic process by which PCBs settle and are resuspended in water such as the Harbor?

A There have been studies done in the past on a variety of toxic substances' behavior with respect to settling and resuspension, PCBs included.

Q Where had PCBs been studied prior to this, your work, as far as you know, on the subject of settling and resuspension?

A Specifically the Hudson.

Q Was that the primary place where there was some data of these types of questions we are talking about, the Hudson River work in connection with PCBs?

A That I was familiar with, yes.

Q One of the factors you were going to work into the model was the flow through the Harbor. Would you describe what that means?

A That would be the net flow through the Harbor that might be occasioned by inputs of flow to the Harbor or withdrawals of water from the Harbor.

Q By places, you mean such as a business or --

A Runoff from the area.

Q How were you to acquire information regarding that? What was your plan?

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A To the best of my recollection, I asked EPA whether they had any information on that matter.

Q And they did?

A Yes.

Q Did they supply all that information to you?

A Yes.

Q We will go into that with regard to specifics.

The mixing process you referred to in the Harbor externally to the Lake, what does that refer to?

A That refers to the motions of Lake water into the Harbor and Harbor water into the Lake, motions of the water within the Harbor itself; degree to which regions of the Harbor interchange with other regions of the Harbor with regard to random-type oscillations.

Q What information was already available before you began work on the model with regard to that?

A The information I referred to earlier with respect to the Encotec reports on data and my own general knowledge of the mixing processes that I mentioned earlier.

Q The Encotec data reflected the mixing processes in what way?

A In the way that substances such as chlorides

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showed a gradient from the inner Harbor to the outer Harbor.

Q Any other way?

A That was the principal.

Q What additional data did you need to have compiled in order to submit to the model that characteristic of mixing internally with the Lake?

A Additional data that was useful and used for that purpose was the dye study carried out by Argonne.

Q Any others?

A Peripherally some of the current studies, but not directly.

Q What do you mean peripherally?

A In the sense of examining the current measurements made by Argonne in a qualitative fashion.

Q Maybe you can explain so I understand what you are talking about about their studies and how you used them.

You knew they were going to do some current studies, is that right?

A Yes.

Q Did they consult with you before they did them or any of their representatives?

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A No, no, not that I recall.

Q Did you give any suggestions as to what should be done before they were done?

A On the current studies?

Q Yes.

A No.

Q As far as you understood, the purpose of doing the current studies was to fit it into your model, was it not?

A The current studies were really not an integral part of our modeling effort, as I indicated. They were incorporated in a qualitative fashion, but we did not make any specific computation with those kinds of measurements.

Q Was that because they didn't show movement out of the Harbor?

A No, it is just that that particular kind of information is not input information into the kind of model that we constructed.

Q Would you tell me what you know about the current studies that Argonne did other than you know they did some?

A My recollection is that the currents were variable, there are oscillations in the current speed

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and direction which were approximately consistent with what one would expect from a harbor-lake system at that time.

Q Did you know that they were unable to show any net current out from the Harbor?

A I don't recall that.

Q How did you acquire your information regarding adsorption current studies?

A From Argonne.

Q Orally?

A They were transmitted to me.

Q Orally?

A No, they were reports and data were transmitted to me.

Q And that consists of both the current reports and the dye study?

A That is correct.

Q You used the dye study and you did not use the current report except in a qualitative sense, is that right?

A Yes.

Q I take it qualitative means you read it but you didn't use any of the data?

A That is correct.

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Q Did you ever talk to anybody at Argonne about the study?

A Yes, there were several meetings at which Argonne was present and presented some of their results.

Q How many meetings were there?

A To the best of my recollection, two or three.

Q At the first such meeting, did they report that they had been unsuccessful in coming up with anything on their first try?

MR. HYNES: First try in what?

MR. POPE: To do a current study.

MR. HYNES: Current?

BY THE WITNESS:

A I don't recall that specifically.

BY MR. POPE:

Q Did you ever ask anybody from Argonne what their degree of confidence was in the report that they included, brought up and prepared?

A You mean their entire report, dye studies, current studies?

Q Or any part of it.

A No.

Q Did you ever talk to anybody at Argonne on

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the subject of whether their work, any of it, was appropriate for extrapolation in your work?

A By extrapolation, you mean incorporation?

Q That is what happens first, I guess, before extrapolation takes place.

A Yes, I did talk to them about the dye studies.

Q Who was that?

A That would be, to my recollection, Jack Ditmars.

Q And you talked to him only about the dye study, or did you talk to him also about the current study?

A I most probably talked to him about the current study, but I don't recall specifically.

Q Do you recall what his conclusions were on the current studies, both of them?

A I think I already indicated I don't recall that.

Q I am sorry.

Do you recall anybody in this case - concluding that there was a double flow, double and opposite flow in the Harbor of current: One layer going out and one layer coming in at the same time?

A I do recall some conversations about that,

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the details of which I don't remember.

Q In any event, you did not take that into account in your study except in a qualitative sense, is that right?

A That's right.

Q Is such a conclusion, double current moving in opposite directions, inconsistent with any of the work you have done in your report?

A No, I don't think so.

Q Is your data that you reflect in your final report consistent with such a hypothesis that there are two flows, one going out and one coming in?

A The data that I used in the final report?

Q The data that you used and the data that you created from other data.

A I didn't create other data.

Q You extrapolated from certain data.

A You have to understand data to me means a measured piece of information. We did no measurements on this study, so we have to distinguish between data and calculations.

Q Let me ask you a very basic question.

Is there anything in your report that is not consistent with the hypothesis which is two

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currents, one coming in and one going out at the same time?

A No.

Q When did you talk to Mr. Ditmars about the dye study, do you remember?

A Exactly, no; but at one of these meetings.

Q Do you know if the dye study was done because somebody connected with this project was not happy with the results of the two current studies?

A I think the dye study was done to provide an estimate of the dispersion and mixing characteristics of the Harbor which would be useful in the mathematical model.

Q Was it your suggestion the dye study be done?

A I was one of the people that suggested it, yes.

Q Was there only one dye study or were there more?

A To my recollection, there was only one.

Q Besides the dye study and the Encotec data, what else did you have in terms of the mixing processes in the Harbor and between the Harbor and the Lake?

MR. HYNES: Again, are we talking about --

MR. POPE: I am talking in terms of doing the

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final report.

MR. HYNES: You are not talking when he initially started working, what information he had before he started?

MR. POPE: I understand that before he started all he had was the Encotec and his own experience.

BY MR. POPE:

Q Is that right?

A Yes, right.

Q At the time you concluded your report, what did you have to supply you with data regarding the mixing processes that went to the Harbor and the Lake besides the Encotec study and the dye study done by Argonne?

A That constituted the information that I used for the mixing processes.

Q Is it your testimony that that was sufficient to provide you with enough information to form statistically significant conclusions for you?

A I believe that that information and the analysis we made of that information provides a reasonable estimate of the exchange between the Harbor and the Lake.

Q Sufficient in your professional opinion for

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you to give your imprimatur to it, is that correct?

A That is correct.

Q I presume when you say a reasonable projection --

A Reasonable calculation.

Q -- reasonable calculation, you are assuming the same kind of answer we talked about before in terms of accurate, that is, it provides you with a reasonable estimate of what is actually happening in real life in the Lake, is that right?

A That is correct.

Q Can you tell me what Cranbrook did on this project?

A My recollection is that Cranbrook carried out a series of surveys, collecting information on PCB concentrations in variable size fractionations and the solids concentrations in variable size fractions.

Q In the various sized fractions?

A The four sizes that we talked about earlier.

Q Is that all?

A That is all I recall at this stage.

Q Argonne did the two current studies, the dye study, is that right?

A Yes.

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Q Anything else?

A They also, as I recall, did some daily measurements of chlorides and temperature, I think, and so on.

I might add, it refreshes my memory that we also used that chloride information to estimate the dispersion coefficient, so in addition to Encotec we used some of that information on the daily chloride scale.

Q Did Mr. Ditmars ever tell you that he didn't feel you could use daily measures of chloride and extrapolate them for any other conclusions other than those specific days?

A I don't recall him telling me that specifically, no.

Q Do you recall discussing that subject generally?

A The subject of extrapolation?

Q Yes, from his data.

A No, I can't say that I do.

Q Did you ever ask him whether in his opinion it would be reasonable or appropriate to apply his data, the daily measurements of chloride, on a 12-month basis?

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A Did we ever have a discussion about that, is that your question?

Q Yes.

A I don't recall that, no.

Q In fact in your report, you do annualize his data, do you not, the data from Argonne?

A Annualize it? What does that mean?

Q That means to take a one-month period and make it into a 12-month period.

Have you ever heard of that concept?

A No, I can't say that I have.

Q We will get to that later.

It is your testimony you did not apply the Argonne data over a 12-month period, is that right?

A If by that you mean we took the Argonne data, the chloride data, and said that is the chloride data that will occur all year around, the answer is no.

Q Who else did either sampling or survey projects for you in connection with this report, do you know?

We have Cranbrook, we have Argonne.

A Well, there were a variety of other people involved doing sampling in the Harbor and Lake area, not all of which individuals I had direct contact with.

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Q Well, if you had access to their results, I would like to know who else was involved.

A That would be the results of Dave Armstrong's work.

Q What was he doing?

A He was doing sediment PCBs.

Q Pardon me?

A Measurements of PCBs in the sediment.

Q Where?

A In the Harbor as well as offshore and in the Lake.

Q In the Harbor and offshore and the Lake?

A Yes.

Q How did those last two differ?

A By offshore, I mean within a few kilometers of the Harbor. By the Lake, I mean the open Lake.

Q His results were made available to you?

A Yes.

Q Did they find their way into your report?

A Yes.

Q Did you discuss with him what he was doing before he went out and collected the samples?

A No.

Q Did you discuss his results afterward?

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A No.

Q Did you ever meet with him in connection with this project?

A No.

Q Do you know him?

A Effectively, no.

Q Is there anybody else who collected data that you had access to?

A I think the data collected by ERG, also on sediment PCBs.

Q I take it Armstrong didn't measure sediment below 5 feet into the sediment, is that right?

A My recollection of Armstrong is that was all surface grabs.

Q How about ERG. What did they do?

A I think that was all surface grabs.

Q Where did they do their work?

A In the Harbor.

Q Were their results made available to you?

A Yes.

Q Did you meet with them?

A No.

Q Did you ever talk to them on the phone on this project?

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A No.

Q Anybody else, any other data that you had available to you?

A There was the data in the Mason and Hanger report.

Q Does that include their final appendix addendum to the final report dated May 1981?

A I don't think so. No, I don't think that would have been included.

Q You have never seen that before?

A I might have. I don't recollect seeing it.

Q What was your purpose in reviewing the Mason and Hanger work?

A It was just to include any additional data that had been compiled or evaluated by Mason and Hanger in our last report.

Q And that Mason and Hanger report was made available to you prior to your submitting your final report, is that correct?

A That is correct.

Q Did your final report include the use of data from Mason and Hanger?

A To the best of my knowledge, some data, whatever was available at that point was included.

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Q Data of what type?

A Again, it would be PCBs in the sediment.

Q Did you have any meetings with representatives of Mason and Hanger regarding either their report or their testing sampling?

A Meetings, no.

Q Did you talk to them on the phone?

A Yes.

Q What was the nature of your discussion on the phone?

A They had some concerns about some of our first estimates on the mass of PCBs in the sediment.

Q Thought it was too high?

A The first estimates, they thought were too low.

Q Who did you talk to at Mason and Hanger?

A I don't recall a man's name.

Q Following that discussion, did you do any revisions in your estimates?

A Yes, I did.

Q On the basis of the information from Mason and Hanger?

A Now, there was an earlier estimate made. That estimate was revised, not only on the basis of

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information of Mason and Hanger, but the additional information I talked to you about earlier that was made available.

Q That revision was to increase the amount of PCBs in the sediment?

A There were two aspects to the revision: One was incorporation of the most up-to-date available data up to that point, and the other was revision in the method of calculation of PCB in the sediment.

Q What was the most up-to-date data available at that time?

A I guess I don't understand; whatever I had. I don't understand.

Q I don't understand what you said.

Why don't you read back my last question and his answer.

(Record read.)

BY THE WITNESS:

A Again, the most up-to-date available data that I had available to me at that time was whatever we had in our hands from those people as of approximately the end of last year.

BY MR. POPE:

Q What was the data dealing with?

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A Sediment concentration, PCB concentration of sediment.

Q Following your discussion with the Mason and Hanger representative, you increased your estimates as to the amount of PCB in sediment, is that right?

MR. HYNES: I think that is mischaracterizing what he said.

MR. POPE: He hasn't answered the question. I haven't mischaracterized anything.

I'm trying to find out --

BY MR. POPE:

Q Did you increase your estimate or decrease?

A I have already indicated that I increased the estimate and made a revision in the calculation.

Q And that revision was based in part on this data from Mason and Hanger that you received, is that right?

A That's right.

Q And that was of new cores they had done or new sampling they had done?

A Yes.

Q Where?

A In the Harbor and in the Ditch.

Q Was that, to the best of your recollection,

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sampling that had been done only to the 5 foot level, or had it gone deeper than that?

A I don't remember.

Q When you talked to the representative of Mason and Hanger, did he or she indicate that they were familiar with what your preliminary estimates had been?

A Yes.

Q As far as you know, did you have some preliminary reports that were circulated within EPA?

A Yes.

Q Was there anybody else that did sampling or survey data that was supplied to you in connection with your report here?

A I think that's it.

Q Did you ever ask anyone at EPA for work that they had available to them with respect to bioaccumulation of fish?

A I did, yes.

Q What did you receive?

A I received from EPA various documents associated with fish, PCB level to fish and PCB uptake by fish.

Q In Lake Michigan?

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A In the Harbor.

MR. POPE: Mr. Hynes, would I be safe to assume that those were ones that have already been produced?

MR. HYNES: Yes.

BY MR. POPE:

Q Did that include test data that shows fish within the Harbor had less than 5 parts per million PCBs?

A It did.

Q Did you take that into account, your report into account in your final --

MR. HYNES: You said that report. I think he testified there were several reports.

BY MR. POPE:

Q Did you take all those fish reports that were made available to you into account in your preparation of your final report here?

A I did.

Q Did you accept them all?

A Accept in what sense?

Q As opposed to disagreeing with the results or the methodology of any of the reports?

A About the only disagreement I had with one of the reports was that one of the uptake experiments

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wasn't carried out long enough.

Q Can you identify that for me?

A It is in one of the reports. I would have to show it to you.

Q The reports you are referring to in terms of fish, were they done by Mr. Steiner and Dr. Veith?

A The Steiner name is familiar, yes. I think that is one of them, and Dr. Veith.

Q Was there any other data that you used in preparing this model other than what we have gone through before so far, the surveys and the samples?

A No, I think that covers it.

Q Did you make certain assumptions about evaporation in doing your study?

A Yes, I did.

Q On what basis did you make those assumptions?

A On the basis of some calculations that the exchanging of PCB between the Harbor and the atmosphere was probably not significant.

Q The exchanging of PCBs between the Harbor and the atmosphere was not significant, is that right?

A Was probably not significant.

Q What basis did you form that?

A We made a calculation.

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Q Assumptions?

A I made a calculation of the exchange coefficient between the water and the water atmosphere.

Q Is that an actual measurement based on empirical data, what was evaporating in Waukegan Harbor?

A No, that is an exchange, that is a calculation based on the theoretical framework.

Q Where did you get that calculation?

A I made it. Where did I get it? I made the calculation myself.

Q Was that an assumption or a conclusion that you had formed in connection with any of your earlier projects for other places in connection with PCBs?

A Yes, I had made calculations on the Great Lakes and on the basis of those calculations and on the basis of some theoretical questions, concluded that perhaps for the Great Lakes as a whole, even there evaporation may not be important.

Q Can you in layman's terms explain why?

A Evaporation of a substance such as PCB would depend on the gradient between the water and the atmosphere; that is, what the difference is between PCB concentration in the water and what the equivalent PCB concentration is in the atmosphere in

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contact with the water.

If that gradient is relatively small, which there is some indication that shows that might be the case, then the exchange will be relatively small.

Q Would it be a fair although simple-minded summary of that to say that just because there is a certain amount of PCB in the air in the Great Lakes area, the evaporation of PCBs from the lakes themselves doesn't have a major impact one way or the other?

A There is no significance to the loss of PCBs from the water to the atmosphere.

Q Because of the presence of PCB in the area, in the Great Lakes area, is that right?

A That's right.

Q Did you do anything in the nature of empirical investigation with respect to Waukegan Harbor to determine that the Harbor fell within that same kind of characteristics that gave rise to that conclusion as to the Great Lakes?

A Empirical investigation to me means going out and doing some measurements. No, I did not.

Q Did you do anything to determine whether that assumption or conclusion had equal application to

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Waukegan Harbor as it had to other cases where you used it?

A As I indicated, I did attempt to estimate, calculate how much PCB might be exchanged across the water interspace for Waukegan Harbor, taking into account the surface area of Waukegan Harbor and concluded that it was not very significant.

Q Is it necessary in doing that calculation to make some kind of an assumption with regard to PCBs in the atmosphere?

A Yes, it is.

Q What assumption did you make with regard to Waukegan Harbor and the amount of PCBs in the atmosphere for the Great Lakes, if that is an easier one to deal with?

A My recollection is that it assumed something on the order of 10 anagrams of PCB per cubic meter.

Q Have you ever seen anything since that time to indicate that is not a reasonable assumption?

A No.

Q When is the first time you went out to Waukegan Harbor?

A It would have been right in the beginning of the contract.

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Q When Exhibit 1 was entered into, which must have been sometime April, May, June of 1979?

A That's correct, during one of the sampling surveys.

Q Have you been back since?

A No.

Q Is that one time in sometime mid-'79, is that correct?

A That is correct.

Q How long did you spend out there?

A A full day.

Q Where were you, out on the boat?

A Yes, I went out on the boat.

Q Whose survey were you monitoring or overseeing at that time?

A It was a Cranbrook survey.

Q Had you worked with Cranbrook before?

A I think we indicated that we had used that data in eutrophication studies, yes.

Q In the Great Lakes?

A Yes.

Q When you started this report, did you have any assumptions or conclusions with respect to danger of PCBs to human beings?

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A No.

Q Was it a subject that you have ever studied?

A No.

Q Did you have any views on whether PCBs in general present a health hazard to man?

MR. HYNES: You are talking about personal views?

BY THE WITNESS:

A I have none.

MR. HYNES: Are you talking about personal or professional? There may be a difference.

BY THE WITNESS:

A I have no professional competency in the area at all as to whether it constituted a human health hazard.

BY MR. POPE:

Q You have written in the Canadien Journal of Fisheries and Aquatic Sciences. You are familiar with that article in 1981, are you not?

A Yes.

Q Equilibrium Model of Fate of Microcontaminants in Diverse Aquatic Food Chains?

A Right.

Q The model with that study in that case indicates that "for PCB, the observed concentration in

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the top predator fish is almost entirely due to food chain transfer and not uptake directly from the water."

That is a true statement, is it not, in terms of general application of PCBs?

A It is a true statement for, I believe to be for top predators, yes, in the aquatic food chain.

Q By top predator, I take it you are talking about sport fish, that kind of --

A Yes, large carnivorous sport fish.

Q In that article, you go on to say:

"This result cast doubt on the adequacy of empirical relationship for PCB or similar substances that estimate concentration factors from laboratory experiments involving uptake from the chemical only. Inference is drawn from such experiments and relationships as to the potential effect on the aquatic ecosystem or health could be in error or by one order of magnitude."

What do you mean by that conclusion in that article?

MR. HYNES: Can you answer that without reference to the article?

BY THE WITNESS:

A What I mean by that is that prior to the

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work reported on in the article, there is a general belief that one can calculate the amount of PCB in the fish simply by proportioning or multiplying the concentration in the water by an appropriate factor.

That conclusion indicates that transfer of PCB from the water to the top predator occurs primarily via a transfer of water to the intermediate levels of the food chain and then by consumption up to the top levels.

BY MR. POPE:

Q And that conclusion, that result calls in question some of the other earlier laboratory studies, is that correct?

A No, it calls in question inferences from those studies.

Q You were aware of that conclusion, that fact at the time of your final report in this case, were you not?

A Yes.

Q And your report is consistent with your finding in the model here in this case, is that right?

A Yes.

Q Was this article prepared on the basis of a project done for the U.S. EPA?

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A Yes.

Q Which project?

A I think it is referenced in the acknowledgments. The grant number is here.

Q Was this done in connection with a particular project at a site, or was this a --

A No.

Q -- a general study commissioned by U.S. EPA?

A That is part of the Great Lakes research project and that incorporates compilation of data over a combination of water bodies.

Q William Richardson of the U.S. EPA is in overall charge of that work?

A That is correct.

Q In terms of your work on this project, did you make any assumptions whatsoever about the hydraulic fluid that was alleged to be the source of PCBs in this area of Waukegan Harbor?

A Not to my recollection.

Q For example, did it matter to you or did you make any assumption with respect to the hydraulic fluid as heavier than water or lighter than water?

A I was aware of the fact that it was heavier than water and only in the calculations associated with

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what the flux out of the Harbor might have been during discharge, that I did qualitatively incorporate that fact.

Q Qualitatively means in a general, not specific place in your report, is that right?

A I think it is mentioned specifically in the report as a qualifier to the calculation.

Q Were you assuming in the diagnosis of this report that the hydraulic fluid was virtually 100 percent PCB?

A I used the figures on product usage that were supplied to me and to the best of my recollection, I did assume that was PCB.

Q The entire amount?

A Yes.

Q We touched on this earlier, but as a further assumption, would it be correct to say that you assumed that that entire amount of hydraulic fluid was Aroclor 1248?

A I don't think I ever made that assumption directly.

Q Did you make any assumption with respect to what form of Aroclor it was?

A I don't think that was a consideration in

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the calculation, per se.

Q Does that mean you made no assumption whatsoever, or that you assumed something but it wasn't a significant Aroclor?

A I assumed the PCB we were dealing with was in the order of 50 percent chlorine PCB, but specifically a given percent Aroclor, I never had a calculation such as that.

Q Was that true with respect to the section on bioaccumulation as well?

A To the best of my recollection, yes.

Q As a matter of fact, the amount of chlorine by weight in a particular PCB would affect bioaccumulation generally, would it not?

A I would say so, yes.

Q It would also affect the degree of degradation with PCB, is that right?

A I would say so, yes.

Q Have you studied any information with respect to the biodegradation of PCB in the environment?

A Not in connection with this project.

Q Were you asked not to comment on that in connection with this project?

A No.

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Q What earlier projects had you focused on that consideration, that factor?

A I had examined that factor in the Hudson River work.

Q Did you detect in that examination any appreciable biodegradation of the PCBs involved there?

A The best of my recollection, my evaluation at that point indicated that biodegradation would be minimal.

Q You were dealing there, were you not, with the higher chlorinated Aroclors, 1254 or 1260?

A 1254 primarily, as I recall.

Q In your listing of the information that you used to prepare your model, I don't know whether you used the U.S.G.S. survey or not. You did not list it here, did you?

A We have to distinguish here between the calculations made on the Harbor versus the calculations made in the Ditch.

Q Why don't you go ahead.

A We used the U.S.G.S. report for the Ditch work, yes.

Q Why did you use it for the Ditch and not the Harbor?

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A Because they made their report on the Ditch.

Q Did you extrapolate any of that information for any place other than the Ditch?

A No.

Q Did you know that Miss Graf has testified she had only 50 to 60 percent confidence range in her conclusions?

A No, I did not know she testified that.

Q If you had known that fact, would it have affected your use of the U.S.G.S. data?

MR. HYNES: Objection. You are saying with regard to her conclusions. She may have made more than one conclusion. You should clarify that for the witness so he is answering the right question.

You can answer the question if you can.

BY THE WITNESS:

A No, I think we pretty well would not have changed anything substantively than what we did because we pretty well also recognized it is a very transient situation in the Ditch and difficult to quantify each transient event.

BY MR. POPE:

Q Transient in what sense?

A In the sense that the Ditch responds very

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markedly to rainstorm, high intensity, short duration type flow inputs.

Q Is there any other data that you used in doing your model or other information?

A Now we are talking about the model of the Harbor, the Ditch, the entire report?

Q The entire report.

A The other information would have been the information utilized in the evaluation of the Lake as a whole.

Q Where did that information come from?

A That would be from the kinds of information I talked about earlier, information of inputs from various documents that are referenced in my manuscript, Internal Joint Commission being one of them, the Murphy report, the subsequent report on PCBs and precipitation by the Canadians; also used information on the plutonium radionuclides that I mentioned earlier that came from data reports and surveys conducted by Argonne; suspended solids information; from a great variety of places.

Q Are they all referenced in your report?

A Yes.

Q Where was plutonium used?

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A It was from the atmospheric fallout in bomb testing.

Q What significance did that play in your PCBs in Lake Michigan?

A It was used as a tracer substance to provide a calibrating variable for settling and resuspension in processes in the Lake.

Q As to Lake Michigan?

A As to all lakes, yes, Lake Michigan.

Q Who was that used by?

A Who was it?

Q Yes, just a specific item of information you had?

A No, this is -- you mean the plutonium data?

Q Yes.

A No, this is information available in the literature.

Q With respect to the properties of settlement and resuspension of PCBs in Lake Michigan?

A No, I said, I used the plutonium data as a calibrating variable to estimate settling and resuspension in systems like Lake Michigan.

Q Are you forming the conclusion there are similar characteristics between plutonium and PCBs

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with respect to settling and resuspension?

A Plutonium does adhere to solids very similarly as PCBs, yes.

Q Is there anything else you had by way of additional information on your work and evaluation of Lake Michigan as a whole?

A In addition, there would be all of the work referenced in the Canadien Journal article.

Q The one we just talked about?

A Yes.

Q Anything else?

A I think that's all.

Q At what point along the line was a decision made to do a study of Lake Michigan generally?

A That was part of the overall research project for Gross Ile.

Q I am talking about in terms of this report which was prepared for this litigation.

When was that decided to become a part of this?

A From that point of view, from the formation of that document, Exhibit No. 1. I think there is a task in there, reference to the impact of the discharge on the Lake.

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Q At any point along the line after you started this project, did the project either expand or contract or your duties change?

A No, not that I recall.

Q It was understood from the beginning that you were going to testify in support of this conclusion, is that right?

A Yes.

Q How many times had you testified in the past prior to today?

A On this project or ever?

Q No, ever.

A In a situation such as this, a trial situation?

Q Yes.

A I have testified at administrative hearings several times but never in a trial situation.

Q How many times have you testified on behalf of U.S. EPA, or the Federal Government, or any other agency?

A I don't think I ever have.

Q Is this the first time you have been involved in civil litigation where you are called upon to give testimony?

A That is correct.

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Q Is this the first deposition you have been involved in?

A That is correct.

Q I have been provided with a document entitled Draft Manuscript, Preliminary Model of Recovery of the Great Lakes Following Toxic Substances Pollution Abatement that you prepared.

A Yes.

Q It is dated March of 1979.

Can you tell me whether this work that is set forth in this report played any role at all in your final report in this litigation?

A Yes, the model that was used in that work for Lake Michigan as a whole was used to estimate the effect of past discharges on PCB concentration in the Lake as a whole.

MR. POPE: Would you mark this multi-page document as Thomann Deposition Exhibit No. 4, please.

(Thomann-OMC Deposition

Exhibit No. 4 marked for

identification, 9/17/81, TLU.)

BY MR. POPE:

Q I'm going to show you Exhibit No. 4 for identification, Dr. Thomann, and ask you to tell me

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the circumstances under which this document was prepared and the model prepared that it refers to.

A I had presented a paper at a workshop in March of 1979 based on the work that I had been doing regarding the mass balance of toxic substances in the Great Lakes, and that work was subsequently pulled together in this draft manuscript.

Q Was that pursuant to some form of grant?

A Yes, this was part of a grant to Manhattan College from the EPA on construction models of toxic substances in the Great Lakes.

Q Did you prepare a model for purposes of this project?

A That is correct.

Q And the model was used basically to show how the Great Lakes would be changed following the abatement of various substances being put into lakes, is that correct?

A That was one of the primary objectives, yes, how long it would take the lakes to respond.

Q This was presented, was it not, just about the same time that you were beginning your work on the project involved in this lawsuit?

A It was prior to that, yes.

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Q What is prior to that?

A This work preceding this work, the work on the lakes as a whole preceding the work on Waukegan Harbor.

Q Right. It was being presented in March of 1979 which was the same time you began work on this overall project?

A Right, the work preceded.

Q Yes, of course, hopefully.

A Yes.

Q In your 1969 paper --

MR. FEATHERSTONE: '79.

BY MR. POPE:

Q (Continuing.) '79, excuse me, you state with regard to model calibration that the input information is sparse and data on water or column levels have been subject to wide variability due principally to changes in analytical techniques. As a result it is suggested that data on the lakes for substances such as DDT and PCB, while useful, is not the best data to use for calibration purposes, is that right?

A That is correct.

Q You were talking there about for calibrating purposes of a model?

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A Yes.

Q Then you go on to list the use of plutonium as a calibrating device, is that right?

A Yes.

Q With respect to PCBs, particularly Page 18 of this report, you state:

"The analysis of suspended solids and plutonium can also be applied to calculate PCB levels in the lakes as an example of the model framework utility. However, there is a great deal of difficulty in calculating a mass balance for PCBs in the Great Lakes in spite of the preceding analyses. This is due to a) uncertainty in input loads, b) uncertainty in the significance of certain PCB mechanisms such as vaporization and c) a wide, rapidly changing range of reported levels of PCB in the water column."

Was that true as of March 1979?

A Yes.

Q Was it also true that in March of 1979, one of the major sources of PCBs to the Lake was recognized as atmospheric inputs?

A Yes.

Q And in this report, you concluded as to that, "Accordingly, the assignment of the PCB concentration

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of precipitation is significant in estimating input loads," and that was input loads through the Great Lakes, is that right, of PCBs?

A Yes, right.

Q Further on the issue of response time, you concluded by saying:

"Therefore, much additional work must yet be carried out to narrow the calculated range of response times. Such work should include consideration of the depth and horizontal extent of sediment areas available for resuspension of toxic chemicals into the overlying water column," is that correct?

A Yes.

Q Did you do that in Waukegan?

A Why don't you read the sentence again.

MR. HYNES: Page 21.

BY THE WITNESS:

A In this work on Waukegan, I really didn't estimate the response time of the Harbor to a control action which is what this paper is directed to.

BY MR. POPE:

Q The response time refers to suspension, does it not?

A No. The response time refers to how long

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you have to wait before the concentration drops to different levels.

Q At any point during the time you were doing the work on this lawsuit, was there any discussion with anybody at U.S. EPA regarding the length of time that it would be necessary to take no action on Waukegan Harbor before acceptable levels of PCB would be experienced?

MR. HYNES: Objection. I think it is vague and misleading, using acceptable levels, no action level.
BY MR. POPE:

Q Good point.

At any point did you have any discussions with anybody at EPA regarding the proposed doing of a study whereby no action would be taken with regard to PCBs in Waukegan Harbor?

A Yes, there were some conversations about that.

Q Who were these conversations with?

A The same people I mentioned earlier.

Q That would be?

A Howard Zar, Didomenico, Gil Veith.

Q Was that the same meeting you referred to earlier in March of 1979?

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A No, there were other meetings along the way, so it would be later on.

Q Tell me what took place at that meeting, to the best of your recollection.

No one else was present but you and those three gentlemen, is that right?

A I don't recall that.

Q Do you recall whether anybody else was present?

MR. HYNES: I think he just answered that.

BY THE WITNESS:

A I don't recall whether anybody else was present.

MR. POPE: Fine.

BY THE WITNESS:

A To the best of my recollection, the discussion centered around what would be involved in making that kind of an estimate.

BY MR. POPE:

Q They asking you whether you had the expertise to do such a study?

A They asking me whether the calculation could be made.

Q What did you tell them?

A Again, to the best of my recollection, the

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gist of my suggestion was that that is a difficult calculation to make. You could make a stab at it with a model as it stood to get some idea of the order of magnitude of the response, but that a more complete evaluation would have to be made when the additional data came in on PCBs in the cores.

Q PCBs what?

A In the cores.

Q Mason and Hanger -- what cores?

A When additional data were made available about PCB in depth.

Q Which has not been done yet?

A No, that data was collected subsequently.

Q What data was that?

A Data on PCB in the sediment with depth, cores, c-o-r-e-s.

Q Who did that?

A That is the kind of data that to my recollection was available from Mason and Hanger.

Q Once that data was made available to you, was there any further discussion of a study to the effect of taking no action?

A No, I don't think it really came up much after that.

Q Would the work that you did in connection with Thomann Deposition Exhibit No. 4 for identification be the kind of study that you would be talking about in terms of studying an effect of not taking any action?

A Yes.

Q One final question, Dr. Thomann.

How did Exhibit No. 4 play a role in the preparation of your final report?

A I used the basic modeling framework for that work in a calculation to estimate the resultant PCB concentration in the Lake during the time of PCB discharge.

Q Which part of Exhibit No. 4 did you use in order to make that?

A It would be the basic modeling framework described in the initial theory section of the report.

Q Initial theory section being Pages 3 through 7?

A Yes, with the modification that the calculations submitted in the Waukegan report, I did not break into different solids classes. I only used one solids class.

Q You basically applied the same modeling

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technique in the work that you had perfected in this Exhibit No. 4, is that correct?

A That is right.

Q This additional data that was made available to you during the past 20 years?

A Yes, that is correct.

Q What did you use by way of data for the past 20 years?

A If you recall in what we are calling the final report, I made an estimate of the flux that emanated from Waukegan Harbor during the time of PCB usage. That was the information that was used as input into the whole Lake Michigan model to calculate the PCB water column concentration.

Q And that basic input data was the amount of purchases at Johnson Motors, is that right?

A Well, the analysis framework that was used to calculate the flux of PCBs in the Harbor to the Lake during the time of discharge is a little more, used a little more information than that, if you recall.

Q It also used the breakdown between amounts going to sediment and amounts going to the Lake?

A That is correct.

Q Anything else?

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A And the estimate of mass of PCBs in the sediment.

Q You said estimate of mass of PCB in the sediment was not arrived at independently of the figures from the Johnson Motors purchase, is that right?

A Yes, it was.

MR. POPE: Mr. Hynes, I would like to break now to continue tomorrow.

(At 5:00 o'clock p.m., the deposition was adjourned to be resumed on Friday, September 18, 1981, at 9:45 o'clock a.m.)

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF ILLINOIS
EASTERN DIVISION

THE UNITED STATES OF AMERICA,)	
)	
Plaintiff,)	
)	
-vs-)	No. 78 C 1004
)	
OUTBOARD MARINE CORPORATION)	
and MONSANTO COMPANY,)	
)	
Defendants.)	

The deposition of DR. ROBERT V. THOMANN,
resumed pursuant to adjournment, at the 14th Floor
Conference Room, 219 South Dearborn Street, Chicago,
Illinois, on Friday, September 18, 1981, at the hour
of 9:45 a.m.

PRESENT:

MR. JAMES T. HYNES,
(Deputy Chief, Civil Division
United States Attorney's Office
219 South Dearborn Street, Room 1486
Chicago, Illinois 60604)

on behalf of Plaintiff, The United
States of America;

MR. MICHAEL A. POPE and
MS. ROSEANN OLIVER,
(Phelan, Pope & John, Ltd.
30 North LaSalle Street
Chicago, Illinois 60602)

and

16-5V28.0/071

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PRESENT: (Continued)

MR. JEFFREY C. FORT,
(Martin, Craig, Chester & Sonnenschein
115 South LaSalle Street
Chicago, Illinois 60603)

on behalf of Defendant Outboard
Marine Corporation;

MR. BRUCE A. FEATHERSTONE
(Kirkland & Ellis,
200 East Randolph Drive
Chicago, Illinois 60611)

on behalf of Defendant Monsanto
Company.

REPORTED BY:

Jean Korinko Sweeney.

* * * * *

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DR. ROBERT V. THOMANN

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DR. ROBERT V. THOMANN,
called as a witness herein, having been previously
duly sworn and having testified, was examined and
testified further as follows:

DIRECT EXAMINATION (RESUMED)

BY MR. POPE:

Q Good morning, Dr. Thomann. You realize
you are still under oath.

A Yes.

Q Mr. Hynes has produced for us some documents
in response to our request yesterday for material that
you looked at in connection with estimates you
had made regarding the amount of PCBs in the sediment.

I would like the court reporter to mark this
as Thomann Group Exhibit No. 5 for identification,
which is a 15-page exhibit consisting of a series of
Illinois Environment Protection Agency documents,
apparently entitled Special Analysis Form.

(Said document was marked Thomann-OMC
Group Deposition Exhibit No. 5 for
identification, as of 9/18/81, JKS.)

BY MR. POPE:

Q I hand you Group Exhibit No. 5 for

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Thomann - direct (Pope)

identification. Would you tell us where you got those materials, and also what you did with them.

A I believe I received these materials from Mr. DiDomenico of the US EPA.

Q Can you tell me approximately at what point in time you received them, or in what context?

A It would have been late last year in connection with the work we were doing.

Q Did you make a request for such documents?

A I don't recall making a request specifically, but during the course of the conversation, in the course of the meeting with Ed, probably around that time, these documents were then sent to me.

Q What significance do those documents in that Group Exhibit have to you?

A Now?

Q Now, or when they were sent to you, or when you discussed them with Mr. DiDomenico.

A I didn't really use them specifically in the calculations and work that I reported on the final report. To the best of my recollection I reviewed them and read the material or reviewed it, but

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Thomann - direct (Pope)

never really used it directly in the final report.

Q We ought to identify for the record what they are. Can you tell me what those records are, as far as you know?

A Yes. These are laboratory results from samples taken at various discharge locations from the Johnson Motors plant.

Q When were they taken?

A Beginning January 31, 1975 and extending on into October, 1975.

Q Did you make your request for data regarding pre-1976 discharges?

A I don't recall making a specific request. I might have indicated that it would be useful to have whatever information was available, so that I could study up on the project.

Q But if I understand correctly, with regard to the information on these documents, you simply reviewed it, and it didn't really play a major part in your report, is that right?

A To the best of my recollection, it did not.

Q Did you put a paper clip on this report

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Thomann - direct (Pope)

here for a sample collected on October 14, 1975?

A I frankly don't remember whether I did.

Q If so its significance eludes you at this point.

A It could have been marked at a place where the discharge from the North Plant is recorded at 8100 micrograms of PCBs.

Q Is that 8,100 parts per million?

A No. That is 8.1 parts per million.

Q 8.1 parts per million?

A Yes.

Q You have no recollection of focusing on that number as of that date?

A Not to the extent that it formed any input into the report. I might have done, as I recall now, and I might have these notes, I might have done some summaries of that, but that never appeared in the final report.

Q What might you have done those summaries for?

A To estimate what the present load was in 1975 from the discharge.

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Thomann - direct (Pope)

Q Estimate what the present load was?

A Or the load in 1975.

Q When you use the term "load," what are you referring to?

A A mass emission rate, such as kilograms per day or pounds per day.

Q Load refers to a rate, is that right?

A A mass rate. A rate of discharge of the substance.

Q It refers to the rate at which a substance is going into something, is that correct?

A How many pounds of the substance per day, for example, is going someplace.

Q While we are at it, let's take another second and mark as Thomann Exhibit No. 6 for identification a four-page document which Mr. Hynes has produced to us this morning, which appears to be a series of calculations regarding Pydraul use from 1959 through 1975.

(Said document was marked Thomann-OMC
Deposition Exhibit 6 for identification,
as of 9/18/81, JKS.)

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Thomann - direct (Pope)

BY MR. POPE:

Q Dr. Thomann, I show you Exhibit No. 6 for identification, and ask you if that is in fact a copy of a portion of your work papers.

A Yes, it is.

Q Can you tell me why that document was prepared?

A I did not prepare this entire document. The basic documents with the exception of some notations were provided to me.

Q The question is why.

A To provide some background information on the usage of Pydraul in the Waukegan area.

Q For what purpose?

A The purpose that this was used for in the final report was ultimately to estimate the mass rate of discharge of PCB from the harbor to the lake during the time that Pydraul was used.

Q What role did the amount of Pydraul that was purchased play in that calculation?

A It played one part of three parts of that calculation. The other two parts being the estimate

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Thomann - direct (Pope)

of the amount of PCBs in the sediment, and the third part being the estimate of the percentage of whatever was discharged that exited to the lake.

Q Now, what part did the amount of pydraul purchased play in that calculation? You told me that it was one of three elements.

A Right.

Q To what extent did that play a role in your estimate of the amount of PCBs transported into the lake?

A The estimate of the amount purchased was used, together with the other two parts of the calculation that I mentioned, as a multiplier on the fraction that was discharged to the lake, to estimate the flux of PCB from the harbor to the lake.

Q The fraction that was discharged to the lake was also an estimate, was it not?

A Yes.

Q Where did you get that estimate?

A That estimate was calculated from the mathematical model representation of the harbor and ditch, where the model was loaded with a unit amount

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Thomann - direct (Pope)

of PCB discharge, and the fraction of that PCB discharge that exited to the lake was calculated.

Q That gave you an estimated percentage of amount used that went into the environment?

A Yes. From that calculation you can make an estimate of the range of the amount used that ultimately exited from the harbor.

Q How?

A Perhaps the best way to do that would be to refer to the report.

Q Fine.

A Perhaps by looking at Figure 55 we could make that calculation a little bit clearer.

As I mentioned, the calculation proceeds by taking the amount of PCBs in the sediment and the fraction of the PCBs that was discharged to the lake. So in Figure 55 --

Q Both of which are estimates, right?

A Yes.

Q All right.

A From the fraction discharged to the lake, and the amount in the sediment, one can calculate

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Thomann - direct (Pope)

the total amount of PCBs that were discharged to the harbor over whatever period the discharge occurred.

Q To the extent that those PCBs are still in the area, in the sediment that you measured, right?

A To the extent that the sediment PCB mass estimate is still there.

Q Right.

A Yes, to that extent.

Q Okay.

A From the estimate of sediment PCB in the mass, and the fraction of PCB discharged to the lake, we then estimated as I indicated the total mass of PCB that was discharged to the harbor.

Q How do you do that?

A That is a simple division; .38, as shown on Figure 55, went to the lake, and .62 went to the sediment. If you are now measuring 207,100 kilograms in the sediment, then 334,000 was discharged. Then at that point we still had not used the amount of PCB product purchased. At that point we simply, from the total PCB product purchased, Figure 55, the estimated 5,300,000 kilograms we can calculate from

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the amount discharged to the harbor the OMC -- or the estimated discharge total mass over the entire period of 724,680.

So that last calculation is taking the product purchased and dividing or subtracting from that -- The 14 percent as noted there is essentially the 724,000 that is estimated to be discharged from the product purchased and the amount to the harbor ditch complex. Taking that discharge, dividing by the total amount purchased is 14 percent.

Q Without the number you have here as an estimate of PCB product purchased, you are not able to make that calculation, right?

MR. HYNES: I am not sure which calculation you are talking about.

BY MR. POPE:

Q The 14 percent.

A Yes. Without the PCB product purchased, one cannot make that estimate, correct.

Q In connection with your work on this project, did you consult with anyone regarding the way the Johnson plant was run in connection with its use of

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Thomann - direct (Pope)

Prydraul?

A To the best of my recollection, it would have been part of other conversations I had with members of the EPA. But I did not consult in detail on how the plant was run, no.

Q Did you consult with any people holding themselves out as experts in the area of hydraulic presses, or aluminum die cast facilities, in terms of how those kinds of plants utilize hydraulic fluid?

A No, I did not.

Q Your calculations of amount of PCBs in the sediment, is it your testimony that those calculations are not dependent in any way on the amount of PCB product purchased?

A That is correct.

Q Am I also correct that your figure here of 334,030 kilograms -- in sediment, is that right?

A No. That was the estimate of the total amount discharged to the harbor.

Q But that's based on your figure of the amount in the harbor sediment, right, 207,100?

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A That is correct.

Q To the extent that your calculation of 207,100 kilograms PCBs in the sediment is correct, that figure is based on your assumption that there are no PCBs below the area of the sediment which you measured or you had access to measure, is that correct?

A That would be correct.

Q Would it also be correct that if in fact there were substantial amounts of PCB below the area of the sediment that you measured, your calculation of the amount going into the lake would be off by an appropriate amount, is that right?

MR. HYNES: I object to the form, "appropriate amount," using that word.

BY MR. POPE:

Q Well, it would be off by the amount that would be based on the amounts that there were additional PCBs below five feet, or whatever the measurement was. Do you follow me?

A Yes, I do.

Q Am I correct?

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A I think you can get an understanding of that from the next figure.

Q First tell me whether I am right or wrong in what I said.

MR. HYNES: Do you remember the question?

Do you need it repeated?

BY THE WITNESS:

A The only part of your question that I didn't like was that the calculation would be off. It would be different, the number would be different by the amount indicated.

BY MR. POPE:

Q Well, what you are doing here is trying to determine how much PCB is in the sediment, right?

A No.

Q And then how much went into the lake.

A This particular calculation is attempting to estimate how much went into the lake, yes.

Q One of the necessary factors in making that calculation is your estimate of how many PCBs are in the sediment, right?

A That is correct.

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Q Now, whether you liked my reference to "off" or not is hardly relevant, it seems to me.

The question is, if there are substantial amounts of PCB in the sediment below the areas measured, your calculation of the amount of PCBs that went into the lake would have to be lowered, would it not?

A If the amount of PCB in the sediment is higher than what I indicated here, then the amount of discharge to the lake is increased, as shown in Figure 56.

Q Why is that?

A The reason for that is that in the estimate, the fraction of PCB that was discharged to the lake in these calculations is held constant. So that if there is a higher amount of PCB in the sediment than I estimated, then that means more was discharged during the period, and hence more went to the lake.

Q Why do you say that if there is more in the sediment, there was more that was discharged?

A Because if I keep the fraction up -- If I know the fraction of PCB that was discharged to the

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lake, in this case the estimate is 38 percent, and there is a mass of PCBs in the sediment greater than what I estimated, then simple division indicates that the discharge, total mass of discharge to the harbor is also greater.

Q So your entire calculation in terms of these two figures is totally based on your assumption that the 38 percent of any discharge is going to the lake, right?

A That is one of the factors, yes.

Q Well, that is the one factor that does not change when empirical data changes, is that correct?

A That's right.

Q Is it your testimony that that percent is correct, regardless of the amount of discharge?

A No. I think that this calculation merely made that assumption.

Q In your determining of the assumption figure of 38 percent, how is that derived?

A Well, as I previously indicated, that was calculated using the form of the mathematical model

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of the harbor and ditch, and inputting into that model a unit input of PCB. I don't remember exactly, but let's say ten kilograms per day. And then calculating of that ten kilograms per day inputted into the upper end of the harbor, we would calculate 3.8 kilograms per day left the harbor and 6.2 kilograms per day was transported to the sediment.

Q What empirical data did you rely on in reaching those percentages?

A Well, that would be a calculation that used the model that had previously utilized the information on dichlorides to estimate the transport of suspended solids in the water body to estimate settling and resuspension, and then PCBs measured during the surveys.

Q We will come back to that.

Were you advised by someone at EPA that Prydraul A-200-B contained PCBs?

A To the best of my recollection, and I have to check the report, as I recall A-200-B was a Terphenyl, not a biphenyl.

Q How did that play a role in your calculations

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of the amount purchased?

A As I recollect, it was not included in that sum.

Q Is that reflected on your final report?

A Yes.

Q Where?

MR. HYNES: Table 6.

BY THE WITNESS:

A Table 6.

MR. POPE: What figure is that, Mr. Hynes?

MR. HYNES: Closest to Figure 53.

BY MR. POPE:

Q Would you explain to me how on Table --
You are talking about Table 4?

A Table 6.

Q Table 6, excuse me. How you dealt with
A-200-B in your calculation?

A Well, it's listed in the table, but it was not included in the sums as indicated at the bottom. Therefore, the sum, for example, only includes F-9, A-200, and unknown, or F-9 and A-200 without the unknown period.

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Q The far right-hand column, is that pounds?

A Yes. There is a typographical error in the headings of those two columns. They should be shifted over. The first column is pounds, and the second column is kilograms.

Q Are these other numbers under kilograms that are indented, are they subtotals?

A No. That's just an indentation error.

Q Did Table 4 get prepared from Exhibit No. 6?

MR. HYNES: Table 6, you mean.

BY MR. POPE:

Q Did Table 6 get prepared from Exhibit No. 6, that Deposition Exhibit No. 6?

A Yes, it did.

Q The assumption made with regard to pounds was that 13.2 pounds was a gallon?

A That is correct. Yes. At 13.2 pounds per gallon, those are the numbers that appear in Table 6.

Q What is this 11.8 pounds per gallon at the top of Deposition Exhibit No. 6?

A That was an additional estimate that I had seen in the literature.

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Q What literature?

A Page 2 of that exhibit indicates my note...
Right here (indicating).

Q So you went to a chemistry book on PCBs, and the author of that book gave an average or a general amount of weight of hydraulic fluid per gallon?

A Yes.

Q Was that weight of PCBs, or weight of the entire fluid?

A I don't recall.

Q Did you ever ask anyone at the EPA what particular weight of Pydraul that was being used?

A I am sorry, I don't understand what the weight of Pydraul --

Q What the weight of the pydraul that was actually being used was per gallon.

A I think that's on the sheet there. That is where I used 13.2.

Q You changed your figure after talking to somebody at the US EPA, is that right?

A Yes. But 13.2 came from here. (Indicating).

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Q Well, where? What does that indicate?
I can't read that.

A It appears to be a date, February 7, 1976,
and some other notation that I can't decipher.

MR. FEATHERSTONE: Is it "meeting"?

THE WITNESS: That's possible. In parentheses, you mean?

MR. FEATHERSTONE: Yes.

THE WITNESS: Yes, that is possible.

BY MR. POPE:

Q Well, am I correct in summarizing that you originally calculated at 11.8 pounds per gallon based on your review of a textbook, and in a discussion or a meeting with somebody from the US EPA, you changed that to 13.2 pounds per gallon.

A No, I don't think that is a correct interpretation.

Q Why don't you tell me what you did, then?

A As far as I can see what I did here was simply attempt to estimate the range in pounds from using those two estimates of the pounds of Pydraul per gallon. That seems to be all I did.

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Q Which did you use?

A 13.2.

Q That is used in all of the data in your final report, right?

A To the best of my recollection, yes.

MR. HYNES: You are specifically referring to the data like on Table 6, and anything derived from that, is that correct?

MR. POPE: It obviously wasn't used in some other part of the report.

BY MR. POPE:

Q Any part of the report where there is a reference to pounds you are using 13.2, is that correct?

A That is correct.

Q Where did you get 13.2, do you know?

A From the second sheet of this exhibit.

Q How did 13.2 appear on the second sheet of Deposition Exhibit No. 6? That is my question.

A It was on that sheet when it was given to me.

Q Who gave it to you?

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A This was given to me, I believe, by Mr. Hynes.

Q Whose handwriting is that in, do you know?

MR. HYNES: Some of it is mine, some of it is an intern that calculated that for me.

BY MR. POPE:

Q So the U.S. Attorney's office prepared Exhibit No. 6 for you. What, the first page, is that right, or the whole thing, or what?

A They didn't prepare it for me specifically. They turned that over to me as you see it, and I made the notations on it, as you see.

Q So the U.S. Attorney's office instructed you in effect to use 13.2 pounds per gallon in your calculations, is that right?

MR. HYNES: I object to the characterization, "instructed."

BY THE WITNESS:

A They turned that material over to me and I essentially used the 13.2.

BY MR. POPE:

Q Well, did they turn it over to you without

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saying a word, is that your testimony?

A To the best of my recollection, when that material was turned over to me, it was turned over in the sense of here is some information that we worked up on Pydraul usage in Waukegan Harbor.

Q You did all your calculations in the final report on this little indecipherable note about 13.2, is that right, without doing any further checking as to what the source of that information was?

A I assumed that that source was reliable, so I did use that 13.2, yes.

Q You didn't do any further checking other than that, whatever is written there, right?

A No, I did not.

Q We are referring to the second page of this Deposition Exhibit No. 6. This thing at the top that refers to 2/7/76, right?

A That is correct.

Q What other writing on this Deposition Exhibit 6 is yours?

A The only other writing would be on the

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third page.

Q Where is that? The right-hand portion of it?

A The two right-hand columns and the fourth column from the right indicating the year.

Q What does that writing consist of?

A Well, this is what I indicated earlier, that this is, to the best of my recollection, a calculation using 11.8 pounds per gallon that I obtained from the chemistry of PCB text, and 13.2 pounds per gallon, which is noted on the earlier page of the exhibit.

Q For the years 1955, 1956, 1957 and 1958?

A That is correct.

Q Am I correct, those numbers do not appear on your Table 6 in the final report?

A The numbers under the 13.2 pounds per gallon appear in the report under the second column from the right for 1955 to 1958.

Q As kilograms.

A The column all the way on the right is kilograms. The column one in from the right is

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pounds. 333,500 pounds for 1955 is the number on the exhibit for 1955.

Q This category is a typographical error, and this should refer to pounds, is that it, on Table 6?

A Yes. I indicated that earlier.

Q Kilograms should be over on the far right-hand corner.

A That is correct.

Q On the last page of this Deposition Exhibit No. 6 for identification there is an indication that appears to be -- What is that, number percent of disposal?

A That looks like pounds. I think that is probably the symbol for pounds.

Q Pounds as a percent of disposal, is that what you understood that to be?

A Yes. It looks that way, yes.

Q Did you use that figure for any purpose at all for preparing your reports?

A No.

Q Did you consider that column?

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A No.

Q Does that indicate disposal of PCBs to someplace other than the Harbor or the North Ditch?

A I really don't know what the basis of that calculation was, and I didn't use it.

Q Did you consider that subject matter, namely disposal of PCBs to some source other than the North Ditch or the Waukegan Harbor?

A Only in a qualitative sense, that presumably all of the PCBs didn't end up in the Harbor and the Ditch, and some of the PCBs were disposed elsewhere. Quantitatively, no.

Q You assumed that, but you didn't go into any of the details as to how or where, or what percentage of the PCBs were disposed of in that fashion, am I right?

A That is correct.

Q Would it be fair to say that your consideration of the PCBs that went to the atmosphere at Johnson Motors received similar consideration we have just gone into? You assumed it happened, but you didn't take that into specific account.

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A That is correct.

Q Is there any percentages that you normally would expect with respect to amounts of PCBs used as hydraulic fluid which would go into the atmosphere?

A I would not have those numbers readily available at my fingertips, no.

Q Have you ever seen any?

A In my review of the various documents that were submitted to me I might have seen some, but I really don't remember.

Q Are you aware of any general calculations or estimates of such a percentage available in the literature, published literature?

A No. I really did not investigate that particular topic.

Q Would you expect there to be a greater amount percentage of PCBs going into the atmosphere when the hydraulic fluid is used in a plant with very high temperatures?

A I would really rather not speculate, since I have not really investigated at all what the losses of PCBs would be to the atmosphere from a

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Thomann - direct (Pope)

hydraulic casting plant.

Q Why did you not take that into account in doing your work on this particular project?

A This particular project was focused solely on the water sector, and for the tasks at hand I did not have to examine that particular question in detail.

Q Well, you didn't examine it at all, did you?

A I did not have to examine it at all.

Q Did anybody at the US EPA suggest to you that you should not examine that question?

A No.

Q At any point during the time you were doing your work on this project did you discuss or did a discussion take place in your presence on the general subject of other aspects of discharge of PCBs from Johnson Motors, other than into North Ditch or the Harbor?

MR. HYNES: Objection; vague. What do you mean by "other aspects"?

MR. POPE: Well, that is what we are talking

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Thomann - direct (Pope)

about; atmospheric, landfill, that kind of thing.

BY MR. POPE:

Q Do you understand my question?

A Yes.

Q Okay.

A To the best of my recollection the topic was discussed at some meetings that I was a party to in presenting my own work. But again, only in a qualitative way was I aware and conscious of the other sources of disposal of PCBs from the area. So to that degree, yes.

Q Those other sources would act as a check on the accuracy of your estimate of the percentage of product purchased which would be discharged into the North Ditch or the harbor, would it not?

A If you knew the degree to which distribution of which the PCBs were disposed of to the other areas with some certainty, it would act as a check, yes.

Q In fact, if you were doing a true mass balance study of products purchased as to where it went, you would have to focus on those things, wouldn't

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Thomann - direct (Pope)

you, those other factors?

MR. HYNES: Objection; vague as to what you mean by a "true mass balance." I don't understand what you mean by "true mass balance." If the witness does --

BY MR. POPE:

Q You understand what I am talking about, don't you?

A If you mean by that trying to account for all of the various routes that PCBs followed after purchase at the plant site, and attempting to account for all of those routes, and add up to the amount of purchase --

Q That would be a mass balance.

A That would be a mass balance, yes.

Q If you wanted to do such a mass balance study, you would have to take these various other avenues of disposal into account, would you not?

A That is correct.

Q Did you ever inquire or learn without inquiring how much of the PCB bearing hydraulic fluid that was purchased by Johnson Motors is

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currently in storage somewhere?

A I believe that that number was discussed, but I don't recollect the order of magnitude.

Q Did you take that number into account in your calculations on this final report?

A No.

Q In terms of any of your estimates as to the amount of PCB in the sediment as a percentage of amount used, that would be a relevant consideration, would it not?

A Well, for the purposes of the calculation that I made it was not a relevant consideration.

Q Which calculation are you talking about?

A The one that we talked about at some length, beginning with Figure 55.

Q It is not a relevant consideration how much of the PCB product purchased remains in storage someplace with respect to your calculation of the percent of product purchased discharged, is that your testimony?

A What I am saying is that the calculation of the 14 percent of product discharged -- of product

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purchased that was discharged, did not rely on that information.

Q Quite correctly. As a matter of fact, it assumed it didn't exist, right? It assumed that no PCB product purchased was in storage.

A Not at all. It doesn't make that assumption at all.

Q Your calculation that the amount of PCB which was discharged into the Harbor or Lake as a percentage of the amount purchased, that 14 percent would stay the same regardless of the amount of PCB purchased which is still accounted for by means of storage, is that correct?

A If I understand what you are saying, that the 5,300,000 kilograms represents -- only some percentage of that represents which was actually used in the Waukegan area. Then to that degree, you are correct.

Q During the course of your work on this project, did you assume that there was no reclamation by Outboard Marine of any of the product that was used?

A I made no such assumption.

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Q You made no such assumption. Did you not assume that it was reclaimed, or you just didn't take it into account?

A I didn't make any assumption about it at all.

Q In Figure 55, if your calculations as to the amount of PCBs in the sediment had been equal to the amount of PCB product purchased, would that have caused you to change your percentages as to the amount, gross amount of PCBs that you would assume would have gone into the Lake?

MR. HYNES: Objection; that calls for speculation.

MR. POPE: I am probing the expert opinion of your witness, Mr. Hynes.

MR. FEATHERSTONE: Jean, could I have that question back.

(Record read.)

BY THE WITNESS:

A I think if the estimate of PCB mass in the sediment was in fact equal to the PCB product purchased, then I would have re-analyzed the problem

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and determined or estimated what the effect of that possibility would be on that loading to the Lake.

BY MR. POPE:

Q One of the factors that would have come under scrutiny would be the percentage of distribution factors between 38 and 62 percent, is that right?

A That is correct.

MR. POPE: I would ask the court reporter to mark this as Exhibit No. 7 for identification. It is a two-page document appearing to be a memorandum dated February 7, 1976 from Mr. Enlow to Mr. Ramig.

(Said document was marked Thomann-OMC Deposition Exhibit No. 7 for identification, as of 9/18/81, JKS.)

BY MR. POPE:

Q Dr. Thomann, I will show you Exhibit No. 7 for identification. This is a document that was provided to us by Mr. Hynes this morning as one of the Johnson memos that you reviewed in connection

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with your work on estimating the amount of PCBs in the sediment. I would simply like to have you look that over and tell me if in fact that is a document out of your work papers, and if that supplied either backup or verification of the figures shown on Thomann Deposition Exhibit No. 6. .

A To the best of my recollection, I merely noted this memo, but did not work with it directly.

Q So you didn't even seek to use that to verify that. You didn't use 7 to verify 6, or vice versa, is that right?

A I don't recall that exactly. I might have, but I don't recall.

Q You basically relied on Deposition Exhibit No. 6, is that correct?

A That is correct.

Q Did the amount of PCB product purchased per year play a role in your calculations, as opposed to the totals?

A In the calculation of the discharge to the Harbor, and sediment, and subsequently to the Lake, no.

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MR. POPE: Miss Reporter, I would like to have you mark a two-page document as Thomann Deposition Exhibit No. 8 for identification, being what appears to be an agenda for, "Workshop on Scientific Basis for Dealing with Chemical Toxic Substances in the Great Lakes."

(Said document was marked Thomann-OMC Deposition Exhibit No. 8 for identification as of 9/18/81, JKS.)

BY MR. POPE:

Q I am going to show you Exhibit No. 8 for identification, and ask if that is an agenda for a seminar where you spoke in Milwaukee, Wisconsin on or about the date indicated?

A Yes, it is.

Q At that program did you speak basically on the paper we marked yesterday as Exhibit No. 4 for identification?

A Yes.

Q At that meeting did you say that you were not able to build the proper model to study PCBs because of uncertainties about food chain mechanism

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and water quality data?

A I believe I made reference to, and this is documented in my paper, to the uncertainty in PCB open lake water measurements in the Great Lakes, and the difficulty that one has then in calibrating a PCB model of the entire lake system. Yes, I did.

Q Did you simply read your paper, or did you vary from the text?

A No, I did not read the paper. I gave an oral presentation.

Q In your preceding answer, were you differentiating open lake situations from harbor situations, in terms of your ability to build an accurate model?

A Yes, I was, in the sense that the open lake water concentrations tend to be fairly low and difficult to quantitate.

Q Is it your testimony that as of March 22, 1979, you were of the opinion that you could build a proper model to show PCB effect in a harbor situation?

A At that conference I did not discuss that particular issue, no.

Q At that conference had you been retained

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by Dr. Veith, or did that occur afterwards?

A I frankly don't remember, but it was right around that time. Whether it was before or after, I don't recall.

Q Do you know whether Dr. Veith was at this conference?

A I don't think he was.

Q Did you attend all the sessions shown in the agenda?

A To the best of my recollection I did.

Q We discussed yesterday the Task Plan executed with Hydrosience, and we understand that you did a final report. Is it possible for you to give me a summary of what you did in between the two?

A I think I need that clarified a little bit.

Q Certainly. From the time of the Task Force Plan, can you tell me what was done by you or members of your staff in order to effectuate your work on this project?

A Following the beginning of the project

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at Hydrosience, the first procedure was to begin work on those tasks. Estimates were made of the PCB mass in the sediment. The model calculations were begun on Waukegan Harbor. The model was programmed -- the program was developed, and the geometry and form of the model -- form of the Harbor was incorporated into the model. Calculations were then made of the transported dispersion characteristics and of the resuspension and settling characteristics. Estimates were made of the amount of PCB that was released from the Harbor to the Lake under present conditions.

A calculation was made on what the unit impact would be of a discharge from the Harbor to the Lake. Comparisons were made of the Harbor discharge mass to Lake-wide discharges.

Q Were all those things done at the office of Hydrosience?

A Yes. The one exception would be the calculation which was run for the first estimate of the impact on the Lake; that is, the discharge of PCB from the Harbor to the Lake.

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Q What do you mean by that was the one exception?

A Pardon me?

Q What do you mean by that was the one exception?

A For that I used the whole Lake model that I had developed earlier.

Q You used the same model, the same computer plan?

A Well, at that point I used the computer model for the Great Lakes as a whole, which is fundamentally the same model as used on Waukegan Harbor, with a different geometry.

That work then was formulated into a report, draft report. Subsequent to that Hydroscience became HydroQual, and an additional amount of work was asked of us to expand the work on the North Ditch, and update the estimate of PCB mass in the sediment.

Q That is based on the Mason, Hanger data that became available?

A Whatever other data became available.

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Thomann - direct (Pope)

Q What other data did become available at that time?

A I think there was additional data that became available from Armstrong, to my recollection. That might have been additional data that was available.

Q You had two reports from Armstrong, ultimately?

A There was a draft report, I believe, or an earlier report, and then a subsequent report which included everything in the earlier report.

Then from that, saw a change in the work done on the second response -- The second request to HydroQual was to update the PCB estimate, mass estimate of the sediment, and to incorporate an analysis of the flux from the Ditch to the Lake.

Q When was that expansion in the project made?

A That would have been in the fall of 1979.

Q Who was it specifically that asked you to do that?

A I believe that was a request from Mr. DiDomenico.

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Thomann - direct (Pope)

Q Who did these various projects? Is there a way you can break down for us the active party at HydroQual?

A Well, within the last phase it would have been, besides myself, Michael Kontaxis, and to a lesser degree James Fitzpatrick, our computer programmer.

Q When did they join HydroQual?

A At the inception of HydroQual, in May of 1980.

Q Are they employees as opposed to being principals?

A Yes.

Q How about the other parts of the project, are you able to tell us, generally speaking, who was in charge of doing the actual work?

A Yes. In the early stages it was John Higgins, who worked under my supervision.

Q In particular areas, or overall? How did you break down the work?

A He specifically did some of the model calculations.

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Thomann - direct (Pope)

Q What is his name?

A Higgins, John Higgins, H-i-g-g-i-n-s.

Q Is he still there at HydroQual?

A No, he is not.

Q Where does he work now?

A I really don't recall. The name of the firm just doesn't come to me right now. But he's with another firm.

Q Where is he?

A Middletown, New York.

Q I take it he left the firm?

A He left the firm when Hydroscience became HydroQual.

Q Who else did work, substantial work on this project, and in what areas?

A Jim Fitzpatrick, James Fitzpatrick, in the early stages did the computer program.

Q Was that his area of expertise?

A Yes.

Q Is he still with HydroQual?

A Yes.

The other individual who had some role to

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Thomann - direct (Pope)

play was John Mueller.

Q Spell that for the reporter.

A M-u-e-l-l-e-r.

Q What is his area of expertise?

A He's a civil engineer.

Q What did he do?

A He assisted in the calculations.

Q He assisted in the calculations which went into prepare the model?

A To some degree, yes; and assisted in the calculations of the preparation for input into the model.

Q On all areas that were important?

A In the Hydroscience areas of the report, yes.

Q I think we ought to clarify that. What areas of the report were done by Hydroscience as opposed to the areas of the report that were done by somebody else? We have just one document in front of us.

A Yes. This document comes from work that was done over the two-year period, not continuously,

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Thomann - direct (Pope)

but was begun under the auspices of Hydrosience, which then, as I indicated was -- Dow Chemical essentially phased out Hydrosience. I don't know what the technical term was. At that point the first stage of the work had already been done. Then there was a period of several months in the beginning of HydroQual before we picked up the project again.

Q Was there some documentation similar to Exhibit No. 1, for identification, whereby the government agreed to pay HydroQual for the remaining work that was not yet done under the Hydrosience contract?

A Yes.

Q What form does that take?

A I don't remember, but I believe it's in the contract file.

MR. POPE: Is it something you brought?

MR. HYNES: Yes. It is with the stuff we gave you yesterday. I think it's the stuff we sent in the mail to you.

This is a contract you are talking

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Thomann - direct (Pope)

about that you sent out, right?

THE WITNESS: Yes.

BY MR. POPE:

Q Why don't you look at this document, Dr. Thomann, and tell me if that is what we are talking about here in terms of the last phase of the project.

A Yes.

MR. POPE: Miss Reporter, if you would mark this four-page document as Thomann Exhibit No. 9 for identification, the first page of which is a letter from John P. St. John to Ed DiDomenico, dated October 9, 1980.

(Said document was marked Thomann-OMC Deposition Exhibit No. 9 for identification as of 9/18/81, JKS.)

BY MR. POPE:

Q Dr. Thomann, this exhibit we have marked as Thomann Deposition Exhibit No. 9 for identification, is this the cover letter and contract with the government to complete the work on the project that was begun under the auspices of Hydrosience?

A Yes.

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Thomann - direct (Pope)

Q That contract was entered into in October of 1980?

A I don't know exactly what date it was formally entered into, but the date of the letter is October 9, 1980.

Q What work had been done as of that date?

A As I indicated, the work that had been done was the work under Hydrosience that culminated in the interim draft report.

Q Did the interim draft report contain the model of the ditch, North Ditch?

A No, it did not.

Q That was one of the things that was added?

A Yes.

Q The other thing that was added was what?

A The evaluation of the latest PCB harbor core and fish data.

Q Anything else?

A And a final report.

Q Revising the preliminary report to the final report, is that right?

A Yes.

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Thomann - direct (Pope)

Q I take it that Mr. Mueller only worked on the project at Hydrosience?

A That is correct.

Q What other people worked on the report, did something substantial, either the interim report or the final report?

A To the best of my recollection those were the principal people.

Q John Higgins, Jim Fitzpatrick and John Mueller?

A Yes.

Q Who is Mr. St. John?

A Mr. St. John is a principal of HydroQual who in this end was an engineer at Hydrosience, and in that capacity acted as a management individual for contract purposes.

Q He was in charge of the business aspects of the relationship?

A That is correct.

Q Did he play any role in the substantive evaluations or calculations that went into the model?

A Not any extensive role, no.

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Thomann - direct (Pope)

MR. POPE: Miss Reporter, if you would mark this document, a three-page document, as Thomann Deposition Exhibit No. 10 for identification, being a letter from Mr. St. John to Mr. DiDomenico, dated July 28, 1980.

(Said document was marked Thomann-OMC Deposition Exhibit No. 10 for identification, as of 9-18-81, JKS.)

BY MR. POPE:

Q What role did IT Envirosience play in this project?

A To the best of my recollection, their role was in the contracting end. They apparently, as I recall, were the contracting agency or contracting firm under which a task quarter existed between US EPA and IT.

Q Is the Task Plan different than the one marked as Deposition Exhibit 1 for identification?

A I am sorry. I really don't have detailed information on how those Task Plans worked.

Q Were you in overall charge of this project?

A Technical in charge, yes.

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Thomann - direct (Pope)

Q What do you mean by technical in charge?

A I was in charge of the technical aspect of the work.

Q Have you ever met Charles Steuwe, S-t-e-u-w-e?

A No.

Q Exhibit No. 9 for identification says that he is going to be the program manager for IT Envirosience, does it not?

A Yes.

Q Did you ever have any contact in this project with either Mr. Steuwe or anyone else from IT Envirosience?

A No.

Q Do you know what IT Envirosience is? Is it a corporation, is it a partnership?

A It is a corporation. Beyond that I don't really -- IT I believe stands for International Tank Corporation. As I said, to the best of my recollection, they acted as the contracting company for this particular task.

Q Did they receive any fee for services in

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this project, as far as you know?

A I believe there is some cost that they assume and charge for as part of that management, yes.

Q Did they review your report before it was submitted to the Government?

A No.

Q Did they review it afterwards?

A No, not to my knowledge.

Q To your knowledge, did they do any managing at all?

A As far as I understand, they did.

Q In what sense?

A To the best of my recollection, in processing our Task charges.

Q You would submit your invoices for professional services to IT Envirosience, and then they would then submit it to the Government, is that the way it worked?

A I don't know exactly, but it was something like that.

Q Calling your attention to Deposition Exhibit No. 10 for identification, which is a letter dated

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July 28, 1980, have you seen that before?

A Yes.

Q I take it that was a letter sent by Mr. St. John to Mr. DiDomenico in the ordinary course of business in connection with this project on or about the date it bears?

A That is correct.

Q Did he talk to you before he sent it out, Mr. St. John?

A I don't recall specifically, but most probably.

Q This letter refers to expansion of some of the project, is that right?

A Yes.

Q Was this expansion the suggestion of HydroQual or the suggestion of the US EPA?

A To the best of my recollection, that was the result of a contact by EPA to HydroQual.

Q EPA called you and asked you to do additional things, is that right?

A To the best of my recollection, yes.

Q That is the reference in the first line

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of the letter, isn't it?

A Yes.

Q So if I understand, this letter, July 28, 1980, is codifying the requests that were made by EPA to HydroQual, to you, to add additional elements or expand a little bit the project that you had already begun under Hydroscience, is that right?

A Yes.

Q And you checked this letter over to see that it did accurately reflect your discussion with Mr. DiDomenico, is that right?

A I don't recall that. The letter might have gone out without my final checking on it.

Q Well, you did read it at some point.

A Yes.

Q It did accurately make reference to the parts of the discussion with Mr. DiDomenico.

A To the best of my recollection, yes.

Q Now, on Page 2 of the letter it says, "In this effort," referring to the evaluation of the latest PCB harbor core data, and inclusion of expanded bed sediment model, in harbor PCB model.

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It says, "This effort would also include additional analysis and compilation of the latest PCB data collected on resident fish in the Harbor as well as resident and migratory fish from the surrounding near-shore waters." Correct?

A Correct.

Q Was that in fact done in the final project?

A I believe the additional information on PCBs in fish was -- some of that was available. I don't recall the degree to which it became part and parcel of the final report.

Q You don't recall?

A No. I'd have to check the final report and the chronology of the data that we had available at the time.

Q Are you able to tell by checking the final report what data you had available on fish in the Harbor?

A I think the question really is a chronology of the availability of data and the degree to which it entered the final report. That would be a little difficult to reconstruct.

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Thomann - direct (Pope)

Q Well, if we wanted to determine what you had available to you in the preparation of your final draft of your final report with regard to fish data, how would we do it?

I well understand there may have been a situation where more data became available after the report was issued. It is certainly possible. My only question is how do we establish what was available to you, that you had access to, and what you didn't as of the time the final report was prepared?

MR. HYNES: Basically you want to find out what information relating to fish studies he utilized or had available to him which he used in the final report.

MR. POPE: Yes.

BY THE WITNESS:

A I did not keep records of the chronology of what data I had available at any particular point in time, so it would be difficult for me to reconstruct the sum total of what I had available in the preparation of this report. Only to the extent that

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there might have been some data available that I had that did not make this final report.

BY MR. POPE:

Q As to fish samples, fish sampling, how would you go about determining whether that was the case?

A I think I'd have to go back and do some thinking, and take a look at what information chronologically might have been available at that time.

Q Well, rather than what might have been available, in terms of your study of bio-accumulation of PCBs in fish, in the final report, does your report contain a reference to all the data that you had available?

A Again, there might have been data I had available, that was made available to me. That I'd have to check, and I could check in the report right now, and see whether that assessment or that check right now would indicate that there was some additional data available to me that was incorporated.

Q Why don't you go ahead. I believe it will

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Thomann - direct (Pope)

save time later.

A It appears from Figure 51 that the data that are starred as opposed to the data that are single dots were additional data that were available since the earlier report.

Q Based on Figure 51, would it be fair to say that as to the studies done on fish in Waukegan Harbor and the area, that the figures that were collected in July of 1979 appear to be the last, most recent available information that you had?

A It appears that way, yes.

Q Was that information not included in your draft report of 1979?

A I don't think so.

Q You think it was not?

A Yes.

Q Does that refresh your recollection as to the reference in Deposition Exhibit No. 10, being references to the July, 1979 fish data?

A Apparently so.

Q As far as you recall as you sit here today, you had no fish data more recent than July of 1979,

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is that right?

MR. HYNES: Are you talking about which was utilized in the report?

MR. POPE: Well, Mr. Hynes, the problem I have with that concept is this. It may not have been utilized because it was totally inconsistent with all the other findings. I don't want to exclude that, obviously.

MR. HYNES: No, I know. I want to make sure your question is clear for the witness. Utilized in the report versus available to him.

MR. POPE: That is why I say available to him.

BY MR. POPE:

Q Do you understand the question?

A The question, as I understand it, is did I have other fish data available to me in the preparation of this figure that is not included here.

I don't recall. That is possible.

Q But I am just trying to seek your best recollection. As you sit here today you have no recollection of having available to you fish data more

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recent than July of 1979 when you prepared that report, is that a true statement?

A I don't recall that. Yes, that is a true statement.

Q Are the data referred to in Figure 51 data with respect to resident fish in the Harbor as well as resident and migratory fish from the surrounding near shore waters?

A No. These, to the best of my knowledge, these data are only data for the resident or migratory fish that were found in the Harbor.

Q As far as you know, you had no additional information with respect to PCB accumulation in fish that were not found solely in the Harbor?

A That is correct.

Q Have you since become aware of any such studies, or samples?

A I have been aware of fish PCB data in Lake Michigan as a whole for a number of years as a part of my research work, and have recently become aware of fish data in the more near shore vicinity of Waukegan Harbor.

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Thomann - direct (Pope)

Q What is the auspices for that data?

A That was I believe collected by the Illinois Department of Fisheries, something to that effect.

Q The Illinois Department of Conservation?

A That could be it, yes.

Q Did you see copies of those analyses?

A Yes, I did.

Q Turning to Deposition Exhibit No. 10 for identification, Mr. St. John goes on: "Specifically, with the inclusion of an expanded bed sediment in the Harbor PCB model, an estimate can be made of how long it would take under a 'No Action' alternative for the concentrations in the Harbor to decline to acceptable levels." Do you recall that?

A Yes.

Q Did you discuss that subject with Mr. DiDomenico when he called you prior to July 28, 1980?

A To the best of my recollection, yes.

Q Was that study ever done?

A No, it was not.

Q Was it not done because Mr. DiDomenico or someone else at the US EPA told you not to do it?

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Thomann - direct (Pope)

A No, I don't think it was a question of them telling us not to do it. They simply didn't include that in the second phase of the work.

Q Am I to understand that everything in Deposition Exhibit No. 10 was included by the US EPA in the second phase of the work other than the study on how long it would take under a no action alternative for the concentrations in the Harbor to decline to acceptable levels, is that a true statement?

A No, I don't think that is a true statement.

Q What other aspects were not included?

A The extension of the spatial extent of the model in Lake Michigan.

Q To eight miles.

A You have got my letter.

Q Referring now to Page 2, the paragraph that begins, "As part of this effort, it is also suggested that the spatial extent of the model be extended in Lake Michigan." Was that your original proposal in terms of studying the effect out to eight kilometers?

A The original eight kilometers was for sampling purposes. We never really specified

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Thomann - direct (Pope)

quantitatively what this spatial extent of the model into Lake Michigan would be.

Q In any event, in July of 1980 you were of the opinion that the spatial extent of the model should be extended in Lake Michigan, and that this was necessary since during the time of discharge to the Harbor calculated PCB concentrations leaving the Harbor were very high, is that right?

A That is correct. I note here that we did suggest that at least several additional miles be added to the geographical limit of the model.

Q And that was not done.

A That is correct.

Q Why not?

A I don't know.

Q Well, did you tell Mr. DiDomenico that this was necessary?

A It was a suggestion to him that that would be a very useful calculation to make, yes.

Q What does this mean in the letter:

" . . . during the time of discharge of PCB to the Harbor, calculated PCB concentrations leaving the

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harbor were very high."

A What we mean by that is as we indicate in the final report; one can make a calculation of the expected concentrations in the Harbor during discharge, and those calculations indicated PCB levels on the order of micrograms per liter, and that is what we mean by very high.

Q When you refer to calculated PCB concentrations, you are talking about your estimates of what happened in the past. That is the reference there, is that right?

A That is what calculated would mean, yes.

Q No one was measuring those kinds of things, right?

A That is correct.

Q I stand corrected now.

Is it true that everything in Thomann Deposition Exhibit No. 10 was added to the final project except for the extent of the model being extended to Lake Michigan, and the study of the no action alternative?

A As indicated in the letter, we had also

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suggested that a computation be made over an approximately 25-year time history to back calculate the possible range of discharge of PCB into the Harbor.

Q To your knowledge, that wasn't done?

A That is correct.

Q What was the significance of doing that kind of study? What would have been the significance?

A It would have been to permit direct computation of the -- or direct estimate of the buildup of PCBs in the sediment that resulted from past discharges.

Q Would that study only go down five feet?

A I don't know whether we had at that point settled on the depth of that calculation.

Q Would it be true that a calculation or estimate focusing on the past 20 years of discharge would properly focus on the sediment below five feet deep?

A My judgment would be that it would focus on not just the area below five feet, but the depth of the sediment from the surface down to some level.

Q Some level beyond five feet?

A We did not -- We were not asked to construct

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that model.

Q I understand. I am talking about generally.

A Well, I would have to -- If I were asked to construct that model today, I would have to sit down and do some thinking about the answer to that question.

Q Well, is there a relationship between time of discharge and depth into the sediment that you would want to study?

A Yes.

Q The longer period of time that the discharge was made, the deeper you would want the sediment information to be, right?

A In general, yes.

Q Is there any literature that you are familiar with that focuses on the relationship between time of discharge and location of sediment of materials such as or including PCBs?

A Yes. I am familiar with the buildup, for example, of plutonium in the Great Lakes sediments.

Q Have studies been done to estimate buildup of sediment as a coefficient of time with regard to that?

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Thomann - direct (Pope)

A Yes.

Q Where is that published? Is that a published report or is it a private report?

A No, that is a published report. A man by the name of Wahlgren, W-a-h-l-g-r-e-n, I believe, summarized some of that information for plutonium in the Great Lakes.

Q In your opinion is that an available analogy to the effect of PCB on sediment over time?

A For that particular kind of open lake system, yes.

Q What particular open lake system was he studying?

A He was studying the open lake systems of all of the Great Lakes.

Q Well, in your opinion would that kind of a study have application to analysis of the effect of PCBs in sediment at the North Ditch?

A The difficulty in the North Ditch would be to the degree to which the sediment is reworked vertically, which happens in the open lake only minimally.

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Thomann - direct (Pope)

Q How about in the Harbor, is it closer as an analogy to the Wahlgren study?

A It would be a little closer in the Harbor, yes.

Q When you say "a little," does that mean it is not a good analogy, or that it is within limits?

A It is a better analogy. Yes, it is within limits.

Q Is there any other literature or studies that you are aware of that focused on the effect on sediment of substances such as PCBs over time?

A I believe that work has also been published for the Hudson situation.

Q Do you know who published that one?

A The work was done by a group at Lemont Geological Observatory of Columbia University.

Q Are there any other such studies that you are aware of, or published reports, articles in the literature?

A Those are the ones that come to mind.

Q At any time during your work on this project, the first portion and the second portion,

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or any other time up to this day, have you been told or have you heard that the US EPA has ruled out a no action alternative to the Waukegan Harbor?

MR. HYNES: I wish you would clarify "no action alternative."

BY MR. POPE:

Q As the reference is made here in Exhibit No. 10.

MR. HYNES: Do you understand the question?

MR. POPE: Do you want to clarify that first, Jim. I can do that.

BY MR. POPE:

Q What did you understand by the reference no action alternative in your discussion with Mr. DiDomenico?

A The reference to no action alternative was to answer the question if nothing was done in the Harbor, how long would it take for the flux out of the Harbor to change, or to decrease.

Q With that as a context, my question was, did you ever learn that the US EPA had ruled that out?

A What I do recall is that the general

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perception of EPA was that that was not an acceptable alternative.

Q Was that on the basis of political grounds or engineering data?

A That I don't know.

MR. POPE: Off the record.

(Discussion had off the record.)

(The deposition was recessed to 1:15 p.m. this date, September 18, 1981.)

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UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF ILLINOIS
EASTERN DIVISION

THE UNITED STATES OF AMERICA,)	
)	
Plaintiff,)	
)	
-vs-)	No. 78 C 1004
)	
OUTBOARD MARINE CORPORATION)	
and MONSANTO COMPANY,)	
)	
Defendants.)	

The deposition of DR. ROBERT V. THOMANN,
resumed pursuant to recess, at the 14th Floor
Conference Room, 219 South Dearborn Street, Chicago,
Illinois, on Friday, September 18, 1981, at the hour
of 1:15 p.m.

PRESENT:

MR. JAMES T. HYNES,

on behalf of Plaintiff, The United
States of America;

MR. MICHAEL A. POPE

and

MR. JEFFREY C. FORT,

on behalf of Defendant Outboard
Marine Corporation;

MR. BRUCE A. FEATHERSTONE,

on behalf of Defendant Monsanto Company.

REPORTED BY: Jean Korinko Sweeney.

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DR. ROBERT V. THOMANN,
called as a witness herein, having been previously
duly sworn and having testified, was examined and
testified further as follows:

DIRECT EXAMINATION (RESUMED)

BY MR. POPE:

Q One of the questions I meant to ask you
this morning was whether you had done any work last
night on the project following the termination of the
deposition yesterday afternoon, whether reviewing the
materials or any additional effort in connection with
this project.

A No. The only thought that came to my mind
last night was the fact you didn't have those notes
that I gave Jim this morning.

Q Similarly, did anything occur to you between
yesterday and today that would cause you to want to
change any of the testimony you gave yesterday or
revise it?

A The only thing that occurred to me I did
recall not mentioning to you that at several of
the meetings with EPA I do recall Kaye Jacobs being
present, and as I recall some other members of the

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Thomann - direct (Pope)

region, the EPA region.

Q Do you remember who they were?

A I don't remember their names.

Q Why don't you tell me how many meetings you had in connection with the projects?

A I didn't keep an actual record of the number of meetings, but I would estimate that in the first Hydroscience phase, up to the last year, perhaps three or four; and since the work for HydroQual beginning in the fall of 1980, perhaps another three or four.

Q Did all those meetings take place in Chicago?

A Yes.

Q All of those meetings were with representatives of the US EPA, is that right?

A That is correct with the exception of the last meeting I had on September 1st with only attorneys of the Justice Department.

Q Mr. Hynes and his associates?

A He was not present, no.

Q Mr. White?

A Mr. White -- oh, I am sorry, Mr. White and

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Thomann - direct (Pope)

Kaye Jacobs.

Q In addition to your meetings with the US EPA and the work that you did specifically in the offices of Hydrosience and HydroQual, did you do any other work or review, or have meetings or consultation with other people in connection with this project?

A I would have occasionally had some consultations and discussion with the people at Grosse Ile.

Q Specifically who?

A Nelson Thomas, who was also present at some of the meetings at the early stages of the project.

Q What role did Mr. Thomas play in this, as far as you know?

A He provided, as far as I know, at least from my recollection at some of the meetings, he provided input and guidance from a technical point of view.

Q Did he provide any guidance to you in connection with your work on this project?

A Not of any significance that I recall.

Q What is his area of expertise, if you know?

A As far as I recall, he is a biologist.

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Thomann - direct (Pope)

Q Besides meeting with people at Grosse Ile, is there anything else that you did in connection with this project other than prepare the models and meet with the EPA?

A No.

Q Did you go to any other site other than the one visit you told me about to Waukegan?

A Not that I recall, no.

Q I show you a multipage document which was previously marked as Ditmars' Deposition Exhibit No. 5 for identification at a previous deposition. I would like you to have a look at that and tell me if you have ever seen that before.

A Yes, I have.

Q In what context did you see it, and when did you see it, and where?

A I don't recall when I first saw it. I don't recall in detail when I first saw it, and I don't recall whether it was either mailed to me or handed to me at one of these meetings. That is all I recollect about it.

Q Tell me what it is, as far as you know?

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A It is some thoughts and notes by Nelson Thomas on a sampling program to support evaluation of the transport of PCBs in Waukegan Harbor.

Q Were those notes, as far as you know, prepared prior to the time you were retained on this project?

A I don't know that.

Q Were those thoughts or notes with regard to sampling done independent of your work?

A To the best of my recollection, my work was already available or was probably available, looking at this. It was probably available and may have formed some input into Thomas' notes. I don't know.

Q By "your work," you are referring to the document which we previously marked Thomann Deposition Exhibit No. 2 for identification?

A That is correct.

Q Did you ever learn from anybody at US EPA or anywhere else why this document was prepared, Ditmars' Exhibit No. 5?

A No, I don't think I did, no.

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Thomann - direct (Pope)

Q Did you ever hear why these people indicated in this Exhibit No. 5 did not perform the functions listed here under the various categories?

A No, I did not.

Q Was this document discussed with you when it was given to you, either over the phone, in writing, or in person?

A To the best of my recollection, it was discussed, but not in any detail.

Q Was this early in the project?

A Yes.

Q Can you tell me which of these samples were actually accomplished to your knowledge, although by somebody else than the people listed as having responsibility?

A I don't recall on number one whether that was actually done.

Q You mean studies of chloride?

A "Input estimates of chloride and lead will be made."

Q That refers to estimates as to lead and chloride, how did they get into the Harbor.

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Thomann - direct (Pope)

A Yes.

Q As far as you know.

A As far as I know.

Number two, I believe was done.

Q That refers to daily samples.

A That is correct.

Q Who was that done by?

A Argonne.

It also refers to dye and current studies.

Q Did they also do meterological, current and Harbor stage measurements, Argonne?

A Yes, to my knowledge.

Q How about number three, the weekly samples?

A Yes, to my knowledge this was done.

Q Did it include samples for lead?

A That I don't recall. I'd have to check.

Q To your recollection, who did those samplings?

A I don't recall exactly who did that sampling.

Q As far as you recall, the information was collected and made available to you?

A Yes.

Q Number four.

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Thomann - direct (Pope)

A Yes, to my knowledge this was done.

Q Do you know who did that? Referring to the sampling for suspended solids by four categories. Right?

A Yes. I believe this was done by Cranbrook Institute.

Q Number five, do you know if that was done?

A To my knowledge, that was done.

Q Including samples taken in the open lake up to eight kilometers?

A I believe yes. Yes, I believe there were samples taken in the open lake. I don't understand, I don't understand the last sentence.

Q "A large sample for sheer stress will be obtained from the Harbor as follows"?

A I don't --

Q With respect to the balance of number five, was that done by Mr. Armstrong?

A To my knowledge, yes.

Q How about number six, was that done, characterization of the Harbor sediments?

A Basically, yes. I don't recall exactly

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Thomann - direct (Pope)

whether it was divided horizontally into three depths, but cores were taken in the Harbor, yes.

Q Were they divided horizontally into any depths?

A Yes, they were.

Q Whose results are we talking about now, whose sampling?

A I don't recall who actually did that work.

Q Is it referred to in your reports?

A I believe so.

Q Would you refer to your report and tell me which work that is you have reference to?

A Well, I believe that work is reported in Mason and Hanger, but I don't recall whether they actually did the work.

It appears from my report that we used three principal sources, the early Battelle work, the Armstrong work, and the ERG.

Q You are referring to Section 3 of your report, Harbor and North Ditch Sediment PCB?

A Right.

Q None of those three involved cores, did they?

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Thomann - direct (Pope)

A No, not to my recollection.

Q Your reference a moment ago to the taking of cores in the Harbor, what does that involve? What were you referring to? Do you want to correct that answer now?

A Well, the report indicates on that same page that a series of borings in slip number three were performed by Worzine Engineering, though were not included in the analysis of our report.

Q Why was that?

A Since as the report indicates, only a small fraction of the data were available.

Q What does that mean?

A We didn't have the data available at the time we made this report.

Q What did you have?

A The Battelle data, the Armstrong --

Q I am sorry, I don't mean to interrupt you. I meant what portion of the data you referred to there was --

MR. HYNES: You mean what portion of the Worzine data?

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Thomann - direct (Pope)

MR. POPE: Yes.

BY THE WITNESS:

A I don't recall exactly.

BY MR. POPE:

Q Once that sampling data was completed, did you review it, the Worzine?

A Following our report?

Q- Yes, sir.

A I did look at it, yes.

Q What conclusions did you reach in reviewing that final data?

A I don't recall reaching any firm conclusion, since I did not do, subsequent to this report, did not do a detailed analysis of that.

Q Did it seem to support your conclusions?

A As I said, I did not really form any conclusions based on that subsequent analysis. So I can't comment on whether it conformed to the earlier conclusions or not.

Q With regard to number seven on Ditmars' Exhibit 5 reference to fish enumeration and sampling will be conducted. Do you know if that was ultimately

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Thomann - direct (Pope)

done?

A I believe there were some fish samples taken, yes.

Q Those were the ones we referred to earlier this morning, the July 1979 tests that appeared in one of your figures.

A I believe so, but I am not entirely sure.

Q Number eight refers to soil samples associated with the beach areas. Do you know whether those soil samples were ever taken?

A I do not know that.

Q Did you ever see any results from soil samples from the beach?

A Not to my recollection, no.

Q Would the amount of PCBs found, if any, near the beach be significant to your work in this report?

A Yes, it would.

Q With respect to number 9, referring to a live fish study, do you know if that was ever done?

A I believe a live fish study was done, but not in this particular fashion.

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Thomann - direct (Pope)

Q Not with clean fish from another lake, is that what you mean?

A No. I mean where they would take the clean fish, put them in the Harbor, and then move them back to the Lake.

Q Where would you go if you wanted to get a clean fish from another Lake in order to study the possible PCB buildup in the Harbor?

A I would go to a lake where there is a fair assurance on the basis of information collected that the fish were not contaminated by PCBs.

Q Would any of the Great Lakes qualify, in your opinion?

A Some of the Great Lakes, yes.

Q Which ones?

A Well, depending on the fish, Lake Superior, Lake Huron, Lake Erie, Lake Ontario, and to some degree, Lake Michigan.

Q It is your testimony you could take fish from those area and you would be relatively confident that they were without PCB contamination, is that right?

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Thomann - direct (Pope)

MR. HYNES: I think you are mis-stating what he said. He said some species of fish from the various lakes. You are taking a qualifier he said and making it a broad statement, and I object to the mischaracterization.

MR. POPE: I am sorry, Mr. Hynes.

BY MR. POPE:

Q Such as what kind of a species are we talking about, Doctor?

A I would think those species in the lower levels of the food chain, the smaller species, where concentrations of such fish collected in the open lake, even if they had some concentrations of PCB, could still be used for a study of this type.

Q Is it true that you wouldn't take what you referred to earlier as a top predator type fish from any of the Great Lakes in order to do the kind of examination that is referred to in that memo?

A Well, since top predators are rather substantially-sized fish, it is practically extremely difficult to work with them in a study like that. So the answer would be yes.

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Thomann - direct (Pope)

MR. HYNES: Could I have that answer back, please.

(Record read.)

BY MR. POPE:

Q Have you ever heard of such a study as is referred to here in number nine, taking clean fish from another lake and putting them in a particular place, and after exposure " . . . these fish will be moved to the Lake to follow PCB losses." Have you ever heard of such a fish study?

A Yes. Experiments like that are carried out.

Q Have you read of such experiments being conducted with respect to PCBs?

A Yes, I have.

Q Who did those, to your knowledge?

A I believe Dr. Gil Veith did an experiment of that type on the Hudson, and to the best of my recollection did a similar type experiment on Waukegan Harbor.

Q Anybody else?

A I don't recall offhand anybody else.

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Thomann - direct (Pope)

Q Did you have access to Dr. Veith's report as it relates to Waukegan Harbor?

A I don't recall whether I had that for this report. I subsequently do have it now.

Q Is this a published document?

A Yes, to my knowledge.

Q With respect to number ten, "In the calculation of the total input of PCBs to Lake Michigan, the atmospheric portion appears to be important." Do you know if measurements were taken as to atmospheric portion of PCB contribution in connection with this project?

A To the best of my knowledge, yes, some additional measurements were taken.

Q Were they taken by Mr. Murphy?

A To the best of my knowledge, yes.

Q Was that pursuant to employment by US EPA?

A I don't know what arrangement he had.

Q Well, then, tell me how you came to learn that he did some atmospheric tests.

A Two ways. One through conversations at some of the meetings, as I recollect.

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Thomann - direct (Pope)

Q Conversations with US EPA people?

A Yes. And through conversations with Dr. Veith.

Q What was at those conversations, what was told to you as to what Mr. Murphy was doing?

A In the first instance it was simply a general comment that additional data were going to be collected on atmospheric inputs. My discussion with Dr. Veith was on the work that Dr. Murphy had done on additional measurements of PCB input.

Q What were you told about that work?

A Dr. Veith indicated that he had some reservations about that work.

Q Did he tell you what the results were?

A Of the later work or --

Q Is that what he had reservations about, or the earlier --

A Yes.

Q -- paper that was published, or are you talking about later work that was done?

A He had reservations about the -- My recollection of my conversation with him, he had

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Thomann - direct (Pope)

reservations about both the later work and the early work.

Q Did he indicate what his reservations were?

A Yes. His apparent reservations were that sufficient attention hadn't been paid to blanks in the determination of the PCB input.

Q Was one of Dr. Veith's concerns the effect of his concern, to the effect that Dr. Murphy had attributed too much contribution to PCBs from the atmosphere?

A Yes.

Q He assigned too high a value to it?

A Yes.

Q In Dr. Veith's opinion.

A Yes.

Q On that basis did Dr. Veith instruct you to ignore that portion, or that information in doing your report?

A No.

Q Did you take into account atmospheric conditions in the doing of your report as an input of PCB into Lake Michigan?

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Thomann - direct (Pope)

A I did.

Q What value did you attribute to atmospheric input?

A Well, following the discussion on some of these concerns, I reviewed the literature again for the final report, and did not rely as heavily on Dr. Murphy's earlier work, but also included work by the Canadians.

Q How did that affect the final report?

A The Canadian input of -- The total Canadian estimate of PCB in precipitation is lower than Dr. Murphy's. As a consequence, the estimated input to Lake Michigan from the atmospheric portion is lower by an appportionate amount.

Q In what way do you believe the Canadian work to be superior to Dr. Murphy's work in this area?

A At that stage in the development of this report I really had no judgment to make on either one of them as being superior, and as a consequence I reported both loads.

Q Will you show where that is in your report?

A Page 98 discusses that question.

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Thomann - direct (Pope)

Q In your opinion, the total present load to Lake Michigan is between 1400 kilograms per year and 5,600 kilograms per year of total PCB, right?

A Correct.

Q Do I understand that you in reporting those figures are simply reporting the figures that appear in the Murphy report, and the Strachan and Huneault Report, is that right?

A Those numbers, 1400 to 5600 kilograms per year come from an application of a range of PCB concentration in the precipitation of 20 to 100 nanograms per liter, which incorporated the range of the mean values of those two documents.

Q Which was which, which was the 20 and --

A The 20 was -- It was actually 21, from Strachan and Huneault.

Q Is that the Canadian reference you referred to?

A That is the Canadian reference.

Q And the 100 is from?

A Murphy.

Q This is the area where you indicated a

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Thomann - direct (Pope)

moment ago that you did not see fit to make a judgment as to which of those two was correct, is that right?

A That is correct.

Q Did the Canadian reference appear in the first draft of your report?

A No.

Q The Murphy did?

A Yes.

Q Following discussion with Dr. Veith, you went back and looked at the literature again, and then you added in the Canadian figures, is that right, for the final report?

A That is correct. To my recollection the Strachan paper came out very close to or right after the first draft.

Q What is the purpose in general of giving figures as you have here on this section of your report at the range that varies from 1400 to 5600?

A The purpose of that calculation was to indicate, based on the information available, what the range was in the present total load to the Lake.

Q But isn't it true from your point of view

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Thomann - direct (Pope)

and reviewing the literature, that if you find two reports with such a wide difference between them, they call in question one or both of the reports themselves, do they not, as to their accuracy?

A The position I take with situations of this type is that by working with a range I am incorporating the present reported values. The range then speaks for itself in terms of the possible uncertainty in those measured values.

Q Well, I am hard put to tell whether that is a yes or a no to my question.

A Maybe I should hear the question again.

Q I am sure we can arrange for that.

Would you read the question back, please.

(Record read.)

BY THE WITNESS:

A I think it is true that a question would be raised about which of those values is more properly representative of the PCB concentration in precipitation.

MR. FEATHERSTONE: May I interject?

MR. POPE: Sure.

MR. FEATHERSTONE: In the Strachan report

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Thomann - direct (Pope)

that you cite, Doctor, where were those measurements taken?

THE WITNESS: To the best of my recollection they were taken throughout the Canadian Great Lakes area, as I indicate, not including Lake Michigan.

BY MR. POPE:

Q I take it the citations are here at the end of your report.

A It is.

Q Were there any other areas in your preliminary draft where after talking to Dr. Veith you went back and changed the values or amended your findings?

A The question specifically refers to talking with Dr. Veith?

Q Yes. About the preliminary draft.

A No, I don't think so.

Q Turning once again to Ditmars' Exhibit No. 5, number 11 on this chart of things to do refers to a joint sampling between USGS and Surveillance and Analysis -- I take it that is US EPA, is that right?

A I believe so, yes.

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Thomann - direct (Pope)

Q That was done, I take it, number 11?

A Yes, to my knowledge that was done.

Q Now, was it done by USGS and US EPA division?

A I am not directly familiar with the role that EPA played in the sampling, but I do know that the US Geological Survey did.

Q Number 12 refers to determination of the extent of groundwater contamination. Do you know whether those wells were ever drilled?

A I believe that some of that work was done, yes.

Q Who was that done by?

A I don't know.

Q Was the information made available to you?

A I believe that in some of the submissions of data for the Harbor that there was some information -- for the Ditch -- I stand corrected -- there was some information contained on those sheets of groundwater contamination.

Q Which report are you talking about that that information was contained?

A That would be data submissions, transmission

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Thomann - direct (Pope)

of data from EPA to us.

Q The transmission of data. Are you talking about things that are specifically referred to in your report, such as Battelle and ENCOTEC, or are you talking about something else?

A I am talking about data sheets that were made available to us.

Q What did those data sheets show?

Data sheets seems to be kind of a general term. Can you tell me how I can find it if I was looking for it?

A There would be information on the suspended solids, PCB concentration in the water, and on the suspended solids. In that particular case I think that is I think the major variables that were included on the sheets.

Q Are you talking about groundwater when you are talking about suspended solids?

A No. I am talking about the data sheets that we received had information on suspended solids in the water, PCB in the water, and PCB on the particulates in the water. Incidentally, on those

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sheets, as I recall, there was information on ground-water.

Q You don't recall who did the sampling?

A No. That was not part of our study at all.

Q What was it conducted for, do you know?

A I don't know.

Q Why was it submitted to you if it wasn't part of your study?

A As far as I understand it, it was on the sheets that were submitted to us, as far as I recall. It wasn't --

Q The sheets that were submitted to you contained that information relevant to your project, and then some additional information that you had known.

A Yes.

Q What I would like to do is be able to say those were part of reports such as Battelle, ENCOTEC, which you have already identified, or they are not, they are something else. Can you do that for me, can you tell me what these are?

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Thomann - direct (Pope)

A I believe on Page 23 of our report we make reference to some of that information. The last paragraph.

Q This type of data you referred to there, and what you have just been testifying about, is that contained in any of your work papers?

A Yes. This appears to be the kind of data sheets that we received.

Q That is what you were just referring to?

A Yes.

MR. FEATHERSTONE: Are you going to mark one of these, so we know what this is when we read the transcript?

MR. POPE: Yes. Why don't we mark all of these documents as a group exhibit. They have on the top of them, "Environmental Protection Agency, Region V Basic Data Form."

Is that what you were referring to, right?

BY THE WITNESS:

A Yes.

MR. POPE: We will mark those as Thomann

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Thomann - direct (Pope)

Deposition Exhibit No. 11 for identification.

(Said document was marked Thomann-OMC
Group Deposition Exhibit No. 11 for
identification, as of 9/18/81, JKS.)

MR. POPE: Ms. Reporter, would you mark as
Thomann Deposition Exhibit No. 12 for identifica-
tion a multipage document which consists of
sample results entitled, "Lake Michigan-Waukegan
Harbor Study, 79C45."

BY MR. POPE:

Q Is that right? Is that the way you read
that?

A Yes.

(Said document was marked Thomann-OMC
Deposition Exhibit No. 12 for
identification, as of 9/18/81, JKS.)

MR. POPE: Would you mark as Thomann
Deposition Exhibit No. 13 for identification a
group exhibit consisting of similar sample
results entitled, "Lake Michigan-Waukegan Harbor
Study, No. 79CL52."

Let me indicate further that those

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identifying numbers are simply on the first page, and there are various reports in here. Similarly for Exhibit No. 12, 79C145 is on the first page.

(Said document was marked Thomann-OMC Deposition Exhibit No. 13 for identification, as of 9/18/81, JKS.)

MR. POPE: If you would mark as Thomann Deposition Exhibit No. 14 for identification a group exhibit consisting of five pages entitled, "Suspended Particle Dry Weights, Cruise No. 1."

(Said document was marked Thomann-OMC Deposition Exhibit No. 14 for identification, as of 9/18/81, JKS.)

MR. POPE: Would you mark as Thomann Deposition Exhibit No. 15 for identification a similar sheaf of five pages entitled, "Waukegan-Cruise II, Suspended Particles Dry Weight."

(Said document was marked Thomann-OMC Deposition Exhibit No. 15 for identification, as of 9/18/81, JKS.)

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Thomann - direct (Pope)

BY MR. POPE:

Q Mr. Thomann, maybe we can go through these things fairly quickly. The documents that we have marked as Deposition Exhibit No. 11 for identification is data you received from US EPA, right?

A Yes.

Q What does that data deal with?

A It deals with PCB concentrations in the water and on the suspended sediment.

Q What suspended sediment?

A The suspended solids in the water sample. What is the concentration of PCB on the solids themselves:

Q In the water?

A In the water.

Q Were those the results of the sampling program that you had originally recommended way back in March of 1979?

A Some of the stations, yes, were occupied as per my original recommendations, and as we discussed yesterday, the various size fractionations, yes. So to a certain degree it reflects my

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recommendations, yes.

Q Those numbers worked their way from that exhibit into your final report, did they not?

A Compilations of them, yes.

Q You relied on the numbers given to you by the US EPA?

A That is correct.

Q Deposition Exhibit No. 12 for identification, can you tell me what that is?

A These also are measurements of temperature and PCBs in the water column and on the suspended material in the water column.

Q Again, are those the results of samples that you had recommended at the beginning of this project be done?

A By and large, yes.

Q Exhibit No. 14 and 15, Deposition Exhibit No. 14 and 15, will you look at those and tell me what they are.

A These are analyses of suspended solids.

Q Where?

A Apparently throughout the harbors and

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Thomann - direct (Pope)

near-shore lake stations.

Q Similarly with 14 and 15, those are numbers that you compiled and put into your report and relied on?

A To the best of my recollection, yes.

Q With any of these exhibits, did you do anything to verify the accuracy of the figures before you put them in your report, or as you put them into your report?

A Not directly, no.

Q This is similar to the area we talked about yesterday. You relied on Dr. Veith and the US EPA to give you accurate numbers, is that correct?

A That is correct.

Q Did you make any assumptions with regard to the degree of accuracy or the degree of confidence that those numbers be treated at?

A In a statistical sense, no.

Q What inquiries did you make with regard to the detectible limits of the people conducting those samples, their ability, the ability of their equipment?

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Thomann - direct (Pope)

A I relied on again the EPA to provide those detectible limits, and they do appear in various places on these sheets.

Q Such as?

A Such as in Exhibit 12, the first line indicates less than .01 micrograms per unit.

Q The detectible limit is what, for Arochlor 1242?

A They could not in that case report a value less than .01. Their detectible limit, I interpreted in that case as .01.

Q The next one down seems to indicate .007, is that right?

A Yes. In that case, for one reason or another, they were able to make an assessment that they could estimate the concentration below that level.

Q Is it true as a general proposition that when measuring substances such as PCBs, as you get close to the detectible limit, your degree of accuracy, or the confidence you have in the results becomes less sure?

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Thomann - direct (Pope)

A Not being an analytical chemist, it would be a little hard for me to comment on that.

Q Well, just in summary, then, you just took the numbers for whatever they were worth, without setting any degrees of confidence in any of these exhibits, is that right, statistically?

A That is correct.

Q In your opinion, ought there to be ranges of confidence in sampling data such as these?

MR. HYNES: Do you understand what ranges of confidence means?

THE WITNESS: Yes. I think it is a valid question that Mr. Hynes has.

Range of confidence may have a variety of different interpretations. Maybe, do you mean -- Maybe you could clarify.

BY MR. POPE:

Q Why don't you tell me, in the conducting of mathematical models from time to time do you assess various data as to the degree of confidence you have in the numbers?

A I do. Sometimes qualitatively, as I indicated

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Thomann - direct (Pope)

yesterday, review the data. If certain aspects of the data appear to be considerably out of line, then I wouldn't use them, and report that back to the people who collected them.

Q Is there any more precise way of determining whether the data is out of line, other than just looking at it and making a judgment call yourself?

A Yes. That would be done in the laboratory, and as I indicated, that would be an area of expertise that is not my area of expertise.

Q In terms of analytical chemistry.

A Yes.

Q What about in terms of the mathematical model? That is within your area of expertise, isn't it?

A What about what?

Q Well, maybe we never really went into what you consider to be your areas of expertise. Maybe you could tell me that.

A My areas of expertise are environmental engineering and water quality model assessment construction and evaluation of the fate of pollutants

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Thomann - direct (Pope)

in the natural environment.

Q Is your degree in environmental engineering?

A My undergraduate degree is in civil engineering, and my master's degree is in civil engineering, and my doctorate is in physical oceanography.

Q Where was the doctorate?

A New York University.

Q Are you trained as a mathematician?

A No.

Q In the preparation of a mathematical model such as is referred to in your final report in this case, did you consult with a trained mathematician as to the accuracy of your figures, or the accuracy of your conclusions?

A No, I did not.

MR. HYNES: Is there some point where --

It is getting late. We don't want him to miss his plane.

BY MR. POPE:

Q Can I ask before we reconvene, Dr. Thomann, if you would provide us with a current resume of your background, and list of publications, if you have one?

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Thomann - direct (Pope)
A Yes.

MR. POPE: Off the record.

(Discussion had off the record.)

BY MR. POPE:

Q I believe we finished number 12.

Referring back to Ditmars' Exhibit 5 for identification, number 13, "To determine the quantity of PCB material in the Ditch, core samples will be collected at 20 sites." Right?

A Yes.

Q Was that done, as far as you know?

A I believe core samples were taken, yes.

Q Is this the same reference that you made a moment ago to number six?

A That is correct.

Q Was it your understanding that at the time Mr. Nelson made this proposal he was talking about doing the same thing twice, or referring to the same types of cores done in both places? This number 13 refers to something different than number 6, does it not?

A Yes.

Q Which was done, to the best of your knowledge,

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Thomann - direct (Pope)

on this project? Both of them?

A To my knowledge, yes.

Q Who did the core samples referred to here in number 13?

A I believe those were samples that were reported by Mason and Hanger.

Q Are those the same ones you referred to earlier here at number six?

A I believe so, yes.

Q One set of core samples?

A That I don't know. I don't recall.

Q That is all you recall seeing, namely Mason and Hanger's results.

A To the best of my recollection, yes.

Q We are talking about various generalities. I am just trying to determine what it was you have looked at. The best way apparently is to refer to Mason and Hanger. I presume you understand when I am making that reference that is to one basic series of samples, is that correct?

A Right.

Q For what purpose did you analyze those

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Thomann - direct (Pope)

Mason and Hanger cores, any?

A To estimate the mass of PCB in the sediment.

Q Did you use those core samples of Mason and Hanger for that purpose?

A Yes.

Q Do you know what number 14 refers to here, multispectral scanner.

A No. I don't recall seeing that work done during -- I don't recall whether that work was done during the dye study, no.

Q As far as you know, it wasn't. The dye study was done, but not the multispectral scanner.

A As far as I know, yes.

Q The dye study was done by Argonne, right?

A Yes.

Q There was also a reference on Page 2 of this document that, "Remote sensing by aircraft will be undertaken to provide additional information on the exchange of Harbor and Lake water." Do you know if that was done?

A I know that aerial photographs were taken of the Harbor, yes.

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Thomann - direct (Pope)

Q Is that what remote sensing means?

A I think that is a more inclusive technical term.

Q As far as you know, the only thing that was done was aerial photographs in that context.

A To my knowledge.

Q Were you provided with those?

A I was provided with one.

Q Did that give you any information that was relevant to your report?

A About the only thing I determined from that aerial photograph is that the Harbor tends to act as a clarification basin, a settling basin.

Q You could determine that from the photographs?

A Yes. The offshore waters were turbid, and the Harbor waters looked clear.

Q What is the significance of that fact in terms of the work you did on flux and transport?

A It tended to confirm in a qualitative way that the gradient of solids was from the Lake into the Harbor, that is solids were higher at the mouth of the Harbor than in the Harbor itself.

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Thomann - direct (Pope)

Q I might ask if that photograph is still in existence that you bring it to the next session of the deposition.

A Sure, yes.

Q Do you want to break right now?

A Yes.

MR. POPE: I will make a statement for the record that we are going to break a little earlier today because the doctor needs to get an airplane back to New Jersey.

THE WITNESS: New York.

MR. POPE: We will reconvene at a time that meets the convenience of counsel and the witness.

(Whereupon the deposition was continued sine die.)

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U.S. Department of Justice

United States Attorney
Northern District of Illinois

United States Courthouse
Chicago, Illinois 60604

JTH:ls
#78,0475

December 9, 1981

Dr. Robert V. Thomann
Hydroqual, Inc.
1 Lethbridge Plaza
Mahwah, New Jersey 07430

Re: United States v. Outboard Marine
Corporation and Monsanto Company
No. 78 C 1004 - (USDC ND IL ED)

Dear Bob:

Enclosed are the original transcripts of your deposition taken in the above-captioned cause on September 17-18, 1981 and November 12-13, 1981.

Please review these transcripts, noting in writing on the attached correction sheets, any errors by page and line number, and then sign these correction sheets where indicated. Please also sign page 755 of the transcripts and have your signature sworn to before a Notary Public.

After completion, please return these transcripts to the undersigned. A self-addressed envelope is enclosed for your convenience. If you have any questions, please contact the undersigned at (312) 353-1996.

Very truly yours,

DAN K. WEBB
United States Attorney

BY: 

JAMES T. HYNES
Deputy Chief, Civil Division

Enclosures

cc: See Page Two.

Dr. Robert V. Thomann
Page Two
December 9, 1981

cc: M. Kaye Jacobs, Esquire (w/o enc.)
Water Enforcement Division
U.S. Environmental Protection Agency
230 South Dearborn Street
Chicago, Illinois 60604

Elizabeth Stein, Esquire (w/o enc.)
Pollution Control Section
Land & Natural Resources Division
Department of Justice
Washington, D.C. 20530

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF ILLINOIS
EASTERN DIVISION

THE UNITED STATES OF AMERICA,)

Plaintiff,)

vs.)

OUTBOARD MARINE CORPORATION)
AND MONSANTO COMPANY,)

Defendants.)

ENFORCEMENT
SENSITIVE

No. 78 C 1004

The continued deposition of ROBERT V. THOMANN, called by the Defendants, pursuant to notice and agreement and pursuant to the Rules of Civil Procedure for the United States District Courts pertaining to the taking of depositions, taken before Thea L. Urban, a Notary Public in and for the County of Cook, State of Illinois, and a Certified Shorthand Reporter of said State, at the United States Attorney's Office, 219 South Dearborn Street, Room 1400 Conference Room, Chicago, Illinois 60604, on the 12th day of November, A.D. 1981, commencing at 10:00 o'clock a.m.

PRESENT:

MR. JAMES T. HYNES,
Deputy Chief, Civil Division
(United States Attorney's Office
219 South Dearborn Street, Room 1486
Chicago, Illinois 60604),

appeared on behalf of the
United States of America;

16-5V28.0/071

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PRESENT: (Continued)

MR. MICHAEL A. POPE,
(Phelan, Pope & John, Ltd.
30 North LaSalle Street
Chicago, Illinois 60602),

and

MR. JEFFREY C. FORT,
(Martin, Craig, Chester & Sonnenschein
115 South LaSalle Street
Chicago, Illinois 60603),

appeared on behalf of Outboard
Marine Corporation;

MR. BRUCE A. FEATHERSTONE,
(Kirkland & Ellis
200 East Randolph Drive
Chicago, Illinois 60601),

appeared on behalf of Monsanto Company.

- - -

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I N D E XWITNESS:Direct Cross Redirect Recross

ROBERT V. THOMANN

By Mr. Pope

324

(Resumed)

415

E X H I B I T SThomann-OMC Deposition
ExhibitMarked for ID

No. 16, 17

325

No. 18 Group

327

No. 19

354

No. 20

376

No. 21, 22

393

No. 23

420

- - -

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(Witness sworn.)

R O B E R T V. T H O M A N N ,

called as a witness herein, having been first duly sworn, was examined and testified as follows:

MR. POPE: Let the record reflect this is the continuation of the deposition of Robert Thomann.

I think we should also reflect, Mr. Hynes, that we have kind of an agreement with regard to a matter that has come up since the beginning of the first deposition; namely, drafts, Dr. Thomann's report, which were circulated which have not been produced. We have a motion before the Judge now and I guess our agreement is that certainly proceeding with this date which was selected a couple of months ago to meet the convenience of the witness and the lawyers is not a waive of our right to interrogate him with regard to those reports if the Court should permit us to have them.

Is that right?

MR. HYNES: That's right.

DIRECT EXAMINATION (Resumed)

BY MR. POPE:

Q Can you tell me whether you have done anything on this project since the time we were together on the last deposition?

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A No, I have not.

MR. POPE: Since that time Mr. Hynes has been kind enough to provide us with some additional information. I wonder if we could take a moment before we begin to identify them and mark the documents for the record.

Exhibit 16 for identification is a copy of a two-page letter to Mr. Hynes dated September 24, 1981; Exhibit No. 17 for identification is a six-page document consisting of Dr. Thomann's Curriculum Vitae.

(Thomann-OMC Deposition Exhibits
Nos. 16 and 17 marked for
identification, 11/12/81, TLU.)

BY MR. POPE:

Q Dr. Thomann, I hand you Exhibit No. 16 for identification and ask if you can tell me what that is.

A This is my estimate of the total estimated consulting income and percent of consulting income from the Government that you asked me to prepare.

Q I take it where there is an indication of 10 percent on the far right-hand column, that would indicate that the other 90 percent of your consulting income would come from private industry. Would that be fair to state?

A Either that or State or other agencies.

Q Would it be fair to say that you do a substantial

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amount of your work for State agencies as well as private individuals and the United States Government?

A Yes. There is some work that is done for State agencies, right.

Q Would the percentages for 1979 and 1980 be in your opinion roughly the same as 1981 will be? We are already in mid-November.

A It probably would be a little higher, maybe three-quarters.

Q More like 75 percent?

A Yes, yes.

Q Of the State consulting work that you will do that will be reflected in the percentages by absence, would that include work done for States by way of grants from the U.S. EPA or would your reference to indirect here include such a situation?

A In some cases I really couldn't recall the ultimate source of the funds for a specific job.

Q So on those you could recall, you included them here even though your immediate entity you were working for was a State Government?

A That is correct.

Q If you knew there were funds coming from the U.S. Government?

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A Yes.

Q Exhibit No. 17 appears to be your Curriculum Vitae, is that correct?

A Yes.

Q You provided that to Mr. Hynes?

A Yes, that is correct.

Q Is that correct and up to date?

A Yes.

Q I take it it lists all of your professional publications, is that correct?

A That is correct.

Q We also received from Mr. Hynes since the date of your last deposition, some documents that appear to be work papers. Before I mark it, I will show it to you and ask if that is in fact a sheet of your work papers in connection with your work on this project?

A Yes, that appears to be some, yes.

MR. POPE: Miss Reporter, I have a nine-page group exhibit here which we will mark as Thomann Group Exhibit No. 18 for identification.

(Thomann-OMC Deposition Group

Exhibit No. 18 marked for

identification, 11/12/81, TLU.)

MR. POPE: The whole of the exhibit appears to be

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handwritten notes, first page of which is entitled Lake Michigan Load History No. 1.

BY MR. POPE:

Q Dr. Thomann, can you tell me what that series of documents is?

A As I recall, this was some estimates made as part of an estimate of a long-term loading to Lake Michigan.

Q Can you tell me when that document was prepared?

A I see here the date is December 4, 1976, which looks very strange because I don't understand why it is that early.

Q Is that your handwriting?

A It is.

Q Were you doing work on this project in 1976?

A No.

Q Can you tell me why the date of 1976 appears in there?

A I really don't know.

Q Is it your best --

A The date, it must have been just some kind of error because the dates of the loading are 1979.

Q Am I correct that on that front sheet, you are assuming that the atmospheric input would increase

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arithmetically from 1950 on?

A Yes, that was the assumption.

Q What was that assumption based on?

A Only that in 1950 there was a lot less use of PCB, so PCB had probably not escaped significantly into the atmosphere at that point.

Q How about the numbers?

A They are strictly an interpolation from starting at zero in 1950 to several thousand kilograms per year in the 1970s.

Q When you prepared that sheet, did you start at the top or work down, or did you start at the bottom and work backwards?

A I would have started in the late 1970s, '75, probably, I don't recall, and established a zero point to 1950.

Q Is there a mathematical division or other relationship these numbers bear starting with that period of 1970 or so and working upwards, three-quarters, half, or something like that?

A To the best of my recollection, it was simply a linear interpolation.

Q What does that mean?

A That means starting with zero in 1950 up to

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5,300 kilograms per year in 1975, over that 25-year period, dividing 5300 by 25 and apportioning that increment, it goes up by 212 kilograms per year.

Q What was the purpose of starting in 1950?

A No particular reason other than at that time, it was believed that the principal sources of PCBs had not yet entered the Lake.

Q What was that based upon, that conclusion or feeling?

A As I recall, that was indicated in some references or documents or papers. I don't recall exactly, but the load from principal sources began in the early 1950s.

Q Principal sources where?

A For the Lake.

Q The Lake as a whole, not focusing solely on Waukegan Harbor?

A No, that is correct.

Q I take it the next column is tributaries?

A Yes.

Q Does that also with the numbers that you put in that column, are they derived the same way; namely, starting in 1970 or so and working backward?

A Yes, it appears so.

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Q Where did you get the numbers for 1970 or whatever dates there?

A As I recall, those were numbers that we obtained from estimates that had been prepared, either by the Great Lakes Basin Commission in some of the earlier documents.

I think we also, and I am not entirely sure, but I think what I did was to take some percentage also of the atmospheric load which fell on the basin and assuming that also would come out in the tributaries.

Q Are you able to tell us which year it was that you started the computations?

A It looks like 1975.

Q Do you know what source you had for information, either on the atmospheric or on tributaries in 1975?

Did you go to a journal or someone who had some published measurements?

A The report there, I think the primary source there for the atmospheric, of course, was the work done by Murphy of DePaul.

Some of the tributary and later estimates was, as I recall, out of the Environmental Strategy Report of the International Joint Commission.

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Q I take it what each of those columns are are measurements of estimates of amount of PCB that would be transferred in a given year from the atmosphere to the Lake and from tributaries to the Lake, is that correct?

A That is correct.

Q And that is measured on a kilogram?

A Kilogram per year basis.

Q In the study that you used to derive the 1975 numbers, did they also attempt to estimate back in time, or was it just simply reporting a number as of 1975?

A It was reporting a number as of 1975.

Q How about the numbers after 1975? Was that also your extrapolation from the 1975 numbers?

A Yes.

Q Did you assume there would be an increase?

A No, I just leveled it off.

Q You assumed that as of 1975 there would not be a measurable increase in the amount of PCBs to the Lake from the atmosphere or tributaries, is that right?

A In this particular --

Q In this exercise.

A Yes.

Q What is the M&I, the third column?

A Municipal and Industrial.

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Q The number 900 appears there. I take it that is 900 kilograms per year?

A Yes.

Q Where did that number come from?

A I believe that also came from a source such as the Environmental Strategy of the International Joint Commission, but I am not exactly sure.

Q The best of your recollection, was that in fact a number that was derived from some published source in which you had confidence?

A Yes, that's correct.

Q Why is there no change in that number from 1950 to 1979 on your sheet?

A Probably because there was no specific information on how that might have changed over the 25-year period, so I just assumed the constant.

Q There was not any indication as to how the atmospheric would change over the 25-year period either, was there?

A No, that's correct.

Q There was no indication of how the number would have changed over the tributary per year, is that right?

A Only to the extent that we added tributary

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load to the atmospheric load.

Q Is there something different from the Municipal and Industrial number that made you not want to do the same kind of extrapolation backwards from 1950 that you did for the first two?

A Only to the extent that it would probably not reflect a changing atmospheric load, so I kept it constant.

Q What was the purpose of doing that?

A It was to see what the long term load history is to the Lake and ultimately what the results in concentration might be in the Lake from that load history.

Q Is it likely in your mind as you sit here today that the load to the Lake from municipal and industrial sources had not changed any since 1950?

A It is possible that there has been some change. For the purposes of this exercise, the degree to which that change influences the ultimate load history would be very difficult to assess.

Q The next column is entitled what?

A Waukegan.

Q Is that intended to be within the category of municipal and industrial?

A No, that is in addition to that.

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Q What was the intent in that column?

A It was to list the load or the assumed load from Waukegan Harbor to the Lake over that 25 or 29-year period.

Q Where did those numbers come from?

A As I recall, those were preliminary estimates made by myself of the flux out of Waukegan during the time when PCBs were used in the Harbor.

Q Flux out of Waukegan Harbor?

A Yes.

Q What were those preliminary estimates based upon?

A The preliminary runs of the Waukegan Harbor model.

Q What is the significance of the line between 1954 and 1971?

A That line indicates that for the purposes of this calculation, I assumed that the load from Waukegan Harbor to the Lake was a constant 4,000 kilograms per year over that time period.

Q What was that 4,000 kilograms, how was that derived?

A As I said, that was an initial estimate of the flux out of the Waukegan Harbor during the time when

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PCBs were used.

Q Is the 4,000 kilograms per year from Waukegan Harbor, say in 1954, derived from your final report? Could I look at it and see the place where it came from?

A As I mentioned, this was a preliminary estimate. I think the 4,000 kilograms per year in the final report is mentioned as the lower bound of what the flux of PCBs from Waukegan Harbor was during the time when PCBs were used.

Q Do you know how many pounds of PCBs were purchased in 1954 by any entity that discharged to Waukegan Harbor?

A In 1954, I don't recall exactly.

Q At any time did you look at that number to determine whether this preliminary estimate made any sense, based on what was actually being used at that time?

A Yes. Later the estimate of the flux to Lake Michigan from Waukegan Harbor when PCBs were being used was, as we discussed the last time, derived from estimates of PCB usage during that period.

Q Estimates from Mr. Hynes?

A That is correct.

Q That was what we were talking about the last

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session of your deposition, what was marked as Deposition Exhibit 6 for identification, is that right?

A Right.

Q That one only goes back to 1959, is that correct?

A I think it goes back a little further. I think the last sheet indicates back to '54.

Q The '54 sheet shows 6,000 gallons were used, is that right, 6,307, being Mr. Hynes' sheet, '59, is that right?

A That is correct.

Q Is it your testimony that that 6,307 gallons is what you checked this number against?

A No.

Q Namely, on Exhibit No. 18, 4,000 kilograms per year?

A No. Information on this Exhibit 18, to the best of my recollection, was prepared before I had this information.

Q Did you ever check it against data as to the usage of hydraulic fluids?

A As I indicated --

Q In those earlier years?

A As I indicated in my earlier remarks, that subsequent to this exercise I did calculate the expected

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flux out of Waukegan Harbor, utilizing that information on usage.

Q Where was the information on usage that you used to check that?

A I'm sorry, I don't understand the question.

MR. POPE: Read back his last answer, would you please?

(Answer read.)

BY MR. POPE:

Q My question was what information on usage?

A The information on usage provided to me by Mr. Hynes.

MR. HYNES: Which is Exhibit 24?

THE WITNESS: Yes.

BY MR. POPE:

Q Starting in 1954, is that right?

A The estimate of the flux from Waukegan Harbor to the Lake during the time when the PCBs were being used was drawn from this information for the final report and for the final estimates of fluxes from the Harbor to the Lake.

Q It was also used to check your figures on Exhibit 18, is that right?

A Only approximately, in the sense that figures

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on that exhibit had a constant steady state value of 4,000 kilograms a year which was, as I mentioned, the lower bound of the estimate given by utilizing the mathematical model of the Harbor and the usage figures.

Q Is it your testimony that based on what you know right now, 4,000 kilograms a year went from Waukegan Harbor to Lake Michigan in 1954?

A To the best of my knowledge now, I would not be comfortable with assigning a specific number to a specific year other than the average of 4,000 kilograms per year during the time of usage, applying over some time period of approximately 20 years.

Q Why is that?

A I think because of the variability that one might expect in a given year of flux out of the Harbor; the flux that one might expect even of usage from year to year that it is really very difficult to assess the flux, what the actual flux might have been in any specific year.

One could as we have done, however, estimate the average flux over that 20-year period.

Q Is it your testimony that in your opinion, to measure the amount of PCBs that moved from Waukegan Harbor to the Lake over a 20-year period is based on

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an average year? Is that what you are saying, is that your testimony?

A If one were actually going to go out and sample what the flux was, of course, then you would carry out a specific survey.

My attempt here was to essentially hind-cast what the flux was from the Harbor to the Lake, in which case that hindcast, I wouldn't extend beyond an estimated steady state average kind of value.

Q Is that a yes answer to my question or a no answer?

A I don't think your question really admits of a yes or no answer.

Q Are there any factors that you are aware of that would indicate to you either as a matter of mathematical modeling or as a matter of common sense that there were average years between 1950 and 1970 is not an intelligent way to estimate how much PCBs would move from Lake Michigan?

A No, I think it is a very reasonable way of estimating to order of magnitude of what the discharge might have been during that period.

Q Do you know what the size of the Outboard Marine Plant was in 1954?

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A No, I do not.

Q Would that be relevant to your calculation of movement of PCBs from Waukegan Harbor to Lake Michigan for that year?

A If you were interested in calculating the actual flux from Waukegan Harbor to the Lake for a specific year, yes, it would be.

Q It would be relevant if you were interested in calculating that amount of flux over a period, would it not?

A In some sense, yes, but in another sense, since these flux estimates or the flux from Waukegan Harbor to the Lake is discharged to a very large body of water, there is a considerable amount of smoothing that goes on of year to year and month to month type fluctuations.

If the purpose is to estimate what the impact is or what the concentration might be on the Lake as a whole, some of those year-to-year fluctuations might not be important.

Q Smoothing, you mean in a mathematical sense, balancing out peaks and valleys, is that right?

A No. I mean in the physical sense that the Lake, since it is a fairly large body of water, will

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tend to smooth out fluctuations and input to the Lake.

Q What do you mean, what does smooth out mean?

A It means there is a lot of mixing in the Lake. It is a very large body of water, so that peaks and valleys will tend to get mixed and not retain their identity.

Q Is there anything that you know about the chemical makeup of PCBs which would indicate that it would be important in analyzing current discharge or movement of PCBs from the Harbor to the Lake, would be important to know when the discharge was made to the Harbor in the first instance and the rough estimates as to the amounts?

A Maybe you better clarify that. You are asking about whether any characteristics of PCBs that would be important in estimating the flux?

Q Is there anything about the chemical characteristics of PCBs or PCB-bearing hydraulic fluid which would indicate to you that in estimating the amount of current movement of PCBs from the Harbor to the Lake, you would want to know with some degree of accuracy when the PCB went into the Harbor and in what amounts per year, and we are dealing with a 20 or 25-year period.

A I think certainly the chemical characteristic

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of PCB relative to its low solubility and the fact that it adsorbs onto particulate matter is an important consideration and adsorption will contribute to PCB entering the bottom sediments and/or subsequently being transported out of the Harbor.

So the solubility of PCB and its adsorption is certainly an important consideration.

Q That is the longer an amount of PCB has been discharged to the Harbor, such as Waukegan Harbor, and that factor would play a role in your current evaluation of movement out to the Lake, is that right?

A You mean evaluations of the current flux from the Harbor to the Lake?

Past history of discharge to the Harbor does not really enter directly in the calculation since the calculation uses the observed sediment PCB concentrations as input. It is essentially taking the Harbor as it exists now and making a calculation on that basis.

Q Without regard to how long the PCB has been in sediment, is that correct?

A That calculation of present flux to the Harbor does not draw on how long the PCBs might have been in the sediments.

Q I understand that, and the reason in your

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opinion why it doesn't draw on that factor is that that is not an important factor in the calculation as to current flux, is that right? Is that your testimony?

A As I said, the way the calculation is done for the present flux, it assumes and uses as input the observed surface sediment of PCB concentration.

Now, that surface sediment of PCB concentration got there because of some past discharge history, but the calculation picks it up from that point and proceeds to estimate the flux given that concentration.)

Q In your work in analyzing that flux, you do not pay any attention to how long the PCBs have been there, is that correct?

A In estimating the present flux, that is correct.

Q In reaching the conclusion that you don't have to analyze how long the PCBs have been there, do you take into account or did you study any scientific or chemical treatises or articles with respect to chemical characteristics of PCBs?

A I have been studying the characteristics of PCBs for a period of time. Yes, I have.

Q The data there on Exhibit No. 18, does that yield the information with regard to the average concentration of PCBs in the Lake in 1975?

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A No, it does not.

Q Is it used for that purpose?

A It can be, yes.

Q Was it used by you for that purpose?

A Yes, I did estimate the concentration in the Lake.

Q What was that, can you show me how you used that data for that purpose?

A As I recall, this information was used in the whole lake model of Lake Michigan to calculate the resulting concentration.

It was also used in a hand computation later by myself in estimating the resulting concentration in the Lake.

Q When you say this was used in your model on the concentration on the Lake, are you talking only about 1975 and later years, or are you talking all the way back to 1950?

A This whole time history was used in a calculation of estimated concentration in the Lake. Subsequent to that, also in the paper that I talked about the last time on the whole lake model of the Great Lakes, the steady state computation was made for 1975 loads of 7 kilograms per year.

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A Figure 55, 56 and Figure 57.

Q It was your testimony you used Exhibit 18 to formulate Figure 55, 56 and 57?

A No, I did not. The Figure 55, 56 and 57, we estimated by the technique that is indicated in the report.

Q As opposed to what you did here on Exhibit No. 18 where you come up with totals of 10,000 at the high point and 7,000 in 1979, is that right, kilograms per year?

A Exhibit 18 includes the estimate of the atmospheric load. Figures 55 through 57 does not.

Q Why not?

A The attempt in Figure 55 to 57 was to estimate the flux just from Waukegan Harbor to the Lake and make an estimate of the resultant concentration in the Lake from that flux alone.

Q Why would you do that?

A Since all of the inputs to the system are additive, I wanted to make an estimate of what the contribution to the Lake was just from Waukegan Harbor alone without invoking any hypotheses of how the atmospheric and tributary loads and municipal and industrial loads might have varied over the years.

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Q Is Figure 55 on your final report intended to be a total number?

You have a kilogram per year. Is that intended to be an average number or what is it?

A That is intended to be an average number over the approximately 20-year period of use of PCBs.

Q We talked a minute ago and for your purposes it doesn't really matter if 2,000 kilograms came to the Lake in one year, is that right?

A No.

Q Came to the Harbor in one year and 40,000 came in the remaining 19 years in terms of average versus age of PCBs?

A Well, I think there is a limit to how far you can push the argument that year to year fluctuations are dampened out by the Lake.

Clearly if several hundred thousand kilograms of PCB were discharged to the Lake in one year, you would get a different response than if several thousand kilograms were spread out over 20 years.

Q Similarly if you had a period of time where there were no PCB discharges to the Lake, that would also affect your averaging technique, would it not?

A If there was a drop in PCBs from certain

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background flux input to zero for the specific year and then back up to that background level, you would probably not see that in the calculation.

Q How about if it happened over five years. That then begins to affect the technique of averaging, does it not?

A Yes, as the length of time extends over which any of the fluctuations of significant magnitude occurs, then one would expect to see a lake responding to those fluctuations.

Q Going back to Exhibit 18, I do not mean to belabor this, but I am in a chicken-and-egg quandary here.

What was the purpose of doing this document, this calculation?

A Again, it was a preliminary estimate of what the resulting order of magnitude of PCB concentration in the Lake might be due to numbers on the order of several thousand kilograms per year.

At the time this calculation was done, the order of magnitude of what the PCB concentration in the Lake might be to several thousands of kilograms per year was not known to me.

Q What did you do with the data on Exhibit 18

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